REPORT
LANDFILL ASSESSMENT
PRATT & WHITNEY PLANT SITE
WEST PALM BEACH COUNTY, FLORIDA
FOR PRATT & WHITNEY AIRCRAFT

JOB NUMBER: 12038-010-26
DATE: JUNE 28, 1983

Dames & Moore

BOCA RATON, FLORIDA

UNITED TECHNOLOGIES
PRT 001 &WHITNEY
AFT

P. O. Box 2691
West Palm Beach, Florida 33402
305/840-2000

Government Products Division

July 6, 1983

Roy M. Duke, District Manager
Department of Environmental Regulation
P. O. Box 3858
West Palm Beach, Florida 33402

Dear Mr. Duke:

Enclosed is our consultant's report, "Landfill Assessment, Pratt & Whitney Site, West Palm Beach, Florida dated June 28, 1983 prepared by Dames & Moore. This report presents the results of the 1982 investigation of ground water contamination at the Pratt & Whitney landfill. Publication of the report has been delayed until this time due to the other environmental activities in progress on the Pratt & Whitney plant site.

As presented in the report and as discussed in our meeting in December 1982, we are proceeding with plans to install a hydraulic barrier/aeration treatment system to prevent migration of the contamination. We have recently completed the installation of eight additional monitor wells to the north and northwest of the landfill to further define hydraulic gradients and contamination boundaries. These new wells will be sampled in July, and when sample results are received, computer modeling will be performed to select the positions of the hydraulic barrier wells. Current plans are to complete the design of the hydraulic barrier/aeration treatment system by approximately the end of the third quarter of 1983.

Also enclosed, in addition to the data in the report, are results of samples taken from landfill wells LF 8 thru 12 and background well PW 17 since the cut-off date (December 1982) for samples in the report. Sample results for landfill wells LF 1 thru 7 have been previously transmitted in our monthly reports.

Should you have any questions, please let us know.

Sincerely,

R H Henson

R. H. Henson
Manager, Plant Engineering

RHH/SLD/pt 1416

Attachments

cc: M. O. Brown
R. DeHan (DER/Tallahassee)
F. J. Gargiulo (Palm Beach County Health Department)
R. J. Guthrie
G. Parker (DER/Tallahassee)
J. L. Seelinger

SUPPLEMENTARY DATA

LANDFILL WELLS - METALS

PRT 001

Parameter	Well	LF 8A	LF 8B	LF 8C	LF 9A	LF 9B	LF 9C	LF 10A	LF 10
	Date	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83
Arsenic		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cadmium		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium		360	54.0	65.0	260	550	360	76.0	74
Chromium, Total		<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron		9.20	3.8	2.7	11.8	32	44	8.40	5.90
Lead		0.075	<0.050	<0.050	<0.050	0.095	0.050	<0.050	<0.050
Manganese		0.14	0.02	0.02	0.11	0.515	0.950	0.17	0.03
Mercury		<0.0002	<0.0002	<0.0002	<0.0002	0.00086	<0.0002	<0.0002	<0.0002
Nickel		0.14	0.02	<0.01	0.02	0.050	0.095	0.02	0.02
Potassium		24	1.55	1.75	4.6	17.2	37.2	4.35	4.10
Selenium		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
Silver		<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.010	<0.010
Sodium		191	25	30	95	70	135	15.1	75
Zinc		0.4	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	<0.05

Concentrations Shown in ppm.

(1419/6-30-83)

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SUPPLEMENTARY DATA

LANDFILL WELLS - METALS

Parameter	Well	LF 10C	LF 11A	LF 11B	LF 11C	LF 12A	LF 12B	LF 12C	
	Date	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	
Arsenic		<0.03	< 0.03	< 0.03	< 0.03	<0.03	<0.03	< 0.03	
Cadmium		<0.01	< 0.01	<0.01	< 0.01	< 0.01	<0.01	< 0.01	
Calcium		140	54.5	70.0	72.5	100	55	65	
Chromium, Total		< 0.01	< 0.01	0.02	0.01	0.01	0.04	0.04	
Iron		2.5	1.0	1.7	1.3	4.5	4.0	2.2	
Lead		< 0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	
Manganese		0.03	<0.01	0.01	0.02	0.03	0.02	0.01	
Mercury		0.00065	<0.0002	0.00023	<0.0002	<0.0002	<0.0002	<0.0002	
Nickel		0.02	0.03	0.04	0.01	<0.01	<0.01	<0.01	
Potassium		2.0	3.28	4.5	4.15	1.02	1.70	1.78	
Selenium		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	
Silver		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	
Sodium		28	55	49	65	23	18	19	
Zinc		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	

Concentrations Shown in ppm

(1419/6-30-83)

SUPPLEMENTARY DATA

BACKGROUND WELL - METALS

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Parameter	Well	PW 17	PW 17	PW 17	PW 17				
	Date	2-12-83	3-12-83	4-9-83	5-10-83				
Arsenic		<0.03	<0.03	<0.14	<0.03				
Barium		<0.05	<0.05	<0.05	<0.05				
Cadmium		<0.01	<0.01	<0.01	<0.01				
Chromium, Total		<0.01	<0.01	<0.01	<0.01				
Copper		<0.01	<0.01	<0.02	<0.01				
Iron		1.7	2.2	1.4	2.11				
Lead		<0.05	<0.05	<0.05	<0.05				
Manganese		<0.01	<0.01	<0.02	0.01				
Mercury		<0.0002	<0.0002	<0.0002	<0.0002				
Nickel		<0.01	<0.01	<0.01	<0.02				
Selenium		<0.008	<0.008	<0.008	<0.008				
Silver		<0.010	<0.010	<0.010	<0.01				
Zinc		<0.05	<0.05	<0.05	<0.05				

Concentrations Shown in ppm

(1419/6-30-83)

SUPPLEMENTARY DATA

LANDFILL WELLS - WET CHEMISTRY

PRT 001

Well	LF 8A	LF 8B	LF 8C	LF 9A	LF 9B	LF 9C	LF 10A	LF 10I
Date	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83
Parameter								
Alkalinity, Total "M" (mg/l)	910	188	212	348	178	810	294	246
Chloride (mg/l)	333	75	85	366	1019	450	120	190
Color (O Units)	71	32	32	25	14	100+	85	100+
Nitrate & Nitrite (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chemical Oxygen Demand (COD) (mg/l)	175	65	35	150	870	330	49	70
pH	6.2	6.7	6.8	6.0	4.9	6.2	6.6	6.1
Residue, Total (mg/l)	1611	403	482	1416	2884	1909	576	744
Specific Conductance (umhos)	2050	480	540	1400	2850	2300	600	820
Temperature (°F)	78	79	78	79	81	80	77	78
Turbidity, Nephelometric (NTU Units)	49.5	49	72	56	49.5	130	69	83

(1419/6-30-83)

SUPPLEMENTARY DATA

LANDFILL WELLS - WET CHEMISTRY

PRT 001

Parameter	Well	LF 10C	LF 11A	LF 11B	LF 11C	LF 12A	LF 12B	LF 12C	
	Date	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	2-1-83	
Alkalinity, Total "M" (mg/l)		252	142	194	258	296	168	244	
Chloride (mg/l)		140	130	120	110	44	45	42	
Color (O Units)		84	24	16	16	54	26	32	
Nitrate & Nitrite (mg/l)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Chemical Oxygen Demand (COD) (mg/l)		30	25	35	65	50	50	50	
pH		6.7	7.1	7.3	7.4	6.7	7.0	7.2	
Residue, Total (mg/l)		690	449	491	521	482	466	577	
Specific Conductance (umhos)		725	570	630	710	575	360	460	
Temperature (^{O}F)		78	76	78	78	77	78	76	
Turbidity, Nephelometric (NTU Units)		36	24	42.5	34.5	17	140	175	

(1419/6-30-83)

SUPPLEMENTARY DATA

BACKGROUND WELL - WET CHEMISTRY

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Parameter	Well	PW 17	PW 17	PW 17	PW 17				
	Date	3-12-83	4-9-83	5-10-83	6-4-83				
Chloride (mg/l)		51	52	53	41				
Color (O Units)		16	30	11	23				
Nitrate & Nitrite (mg/l)		0.01	0.01	0.01	0.01				
pH		6.8	6.8	6.7	6.6				
Turbidity, Nephelometric (NTU Units)		6.9	7.2	5.6	4.1				

(1419/6-30-83)

PRT 001 Dames & Moore

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(305) 392-9070

June 28, 1983

Pratt & Whitney Aircraft Group
Government Products Division
P.O. Box 2691
Beeline Highway, State Road 710
West Palm Beach, Florida 33402

Attention: Mr. James L. Seelinger

Gentlemen:

Report
Landfill Assessment
Pratt & Whitney Plant Site
West Palm Beach, Florida
for Pratt & Whitney Aircraft

Dames & Moore is pleased to submit this report of our assessment of ground water quality at Pratt & Whitney's landfill site. This investigation involved the installation of over 30 monitor wells and soil borings, aquifer permeability testing, ground water level measurements, ground water quality analyses, and data evaluations.

Based on the work described in this report, we have concluded that leachate in the ground water around the landfill has been predominantly generated by the former trench landfilling operations. The leachate is generally limited to relatively small areas beneath and along the northern perimeter of the landfill area. Volatile organic compounds are the principal constituent of the leachate.

The evidence suggests that the leachate is extremely slow moving. However, we are recommending that a hydraulic barrier/leachate recovery system be designed to contain the contaminants to this present location and to recover the leachate for renovation and disposal.

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We appreciate the opportunity to be of service to Pratt & Whitney in this investigation. If you have any questions, please call.

Yours very truly,

DAMES & MOORE

Charles P. Gupton, P.E.
Partner

Mark R. Stephens, P.G.
Senior Hydrogeologist

CPG/MRS:jl/NR4
(3 copies submitted)

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REPORT
LANDFILL ASSESSMENT
PRATT & WHITNEY PLANT SITE
WEST PALM BEACH COUNTY, FLORIDA
FOR PRATT & WHITNEY AIRCRAFT

INTRODUCTION

Pratt & Whitney owns and operates a landfill on its property located in north central Palm Beach County, Florida. The site location is shown on Plate 1. The landfill is presently used to dispose of solid wastes such as trash and garbage generated on site.

During the course of an investigation of ground water contamination at Pratt & Whitney's water supply wellfield conducted by Dames & Moore in 1981, low levels of volatile organic compounds were found in ground water samples collected near the landfill. As a result of this observation, Pratt & Whitney committed to an investigation of potential ground water contamination that may be related to the landfill operation.

This report details the findings and assessments of the landfill area ground water quality study conducted from December 1981 through the end of August 1982. The purposes of the investigation were:

1. to define the hydrogeologic conditions of the shallow aquifer in the landfill area;
2. to identify the extent and degree of ground water contamination around the landfill, and;
3. to identify a conceptual leachate control system to prevent the migration of contaminants identified within the landfill leachate.

To meet this end, Dames & Moore systematically reviewed and analyzed all obtainable information concerning the landfill; chronology, hydrogeology, and ground water geochemistry. Much of the information for this investigation was developed from data collected in over 30 monitoring wells and test borings installed in the vicinity of the landfill. Also included in

this report are data and information obtained during a previous Dames & Moore ground water investigation conducted in the area of Pratt & Whitney's water supply source.

BACKGROUND - LANDFILL AREA CHRONOLOGY

PRE-LANDFILL SOIL TYPE

Prior to any waste disposal in Pratt & Whitney's landfill area, the natural terrain was a wetlands, characterized by a high water table and shallow circular depressions containing seasonal standing water.

The regional soil types that characterized the area were Pineda, Riviera and Depressional Riviera sands. These soil types are generally poorly drained, nearly level sandy soils with a loamy subsoil. The soils are generally composed of fine to medium grained sand and are less than five feet in thickness. Generally, the water table within the Pineda and Riviera sands is within 10 inches of the surface during the wet season and as low as 30 inches below ground surface during the dry season. Depressional Riviera sands however may contain standing water for longer periods of time (USDA 1978).

TRENCH LANDFILL DEVELOPMENT - CHRONOLOGY

Undocumented records indicate that about 1957, Pratt & Whitney intended to construct a test stand area just north of the present landfill area entrance. Subsequent to filling and grading of the site, the proposed test stand area was relocated. Even though much of the fill material was removed, the area remained as raised ground and apparently provided a convenient site for waste disposal.

From 1958 to 1972 wastes were disposed in a series of excavated trenches. The trenches began adjacent to the southern boundary of the proposed test stand area and progressed southward terminating at the site of the present sanitary area landfill. The approximate location of each trench is shown on Plate 2.

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Approximately six trenches were utilized by Pratt & Whitney during this time. Aerial photographs of the landfill area taken from 1959-1970 reveal two parallel trenches oriented in an east-west direction, immediately adjacent to the northwest corner of the polishing pond. These trenches are labeled T-1 and T-2 on Plate 2. Trenches T-1 and T-2 were approximately 200-250 feet long and 30-40 feet wide. The depths are assumed to have been 10-12 feet. The northernmost trench was L-shaped; the base of the "L" extended approximately 125 feet in a northward direction from the trenches eastern extremity.

Earlier photographs indicated that no trenches were in use prior to 1958. Hence, it is assumed that trenches T-1 and T-2 were the first trenches.

The aforementioned photographs indicate that two succeeding trenches (T-3 and T-4) were utilized prior to 1970. These trenches were also parallel, oriented generally northeast-southwest, and located approximately 100 feet southwest of trenches T-1 and T-2. Trenches T-3 and T-4 were an estimated 175 feet long, 50 feet wide and 10-12 feet deep. The photographs also suggest the location of another trench, T-5. This trench is estimated to have been 200 feet long, 60 feet wide and 10-12 feet deep and in use between 1965 and 1970.

A 1970 photograph shows the location of Trench T-6, approximately 200 feet south of trenches T-1 and T-2. This trench is thought to have been the final trench, in use until 1972. It was approximately 200 feet long, 60 feet wide and 10-12 feet deep.

The wastes disposed in the trenches were typically solid waste (trash and garbage materials) and liquid wastes (fuels, oils, etc.). Daily waste disposal was accomplished by dropping the wastes at the perimeter of the trench in use, dousing it with an ignitable fluid and then burning it. Every few days or so, the waste accumulated at the perimeter was bulldozed into the center of the trench. At capacity, the trench would be closed by covering the debris with two or three feet of fill material. Prior to closure, a new trench was excavated for later use. This excavated soil may have been the cover material used on the preceding trench.

The exact composition and origin of fill material which was used as "cover" for the landfill trenches is not known. Presumably, much of the fill material was Pineda and Riveria sands, composed predominately of fine to medium grained sand, and some silt and clay excavated from the trenches and other on site sources such as borrow canals and ponds. These sediment types have been continually identified during soil sampling operations at Pratt & Whitney.

SANITARY LANDFILL DEVELOPMENT

In 1972, a ban on "open pit" burning prohibited the use of trench landfills. As a consequence, Pratt and Whitney designed a sanitary landfill to meet their disposal needs, as well as to conform with new regulations. The former trench site was retained as the site for the new sanitary landfill. The sanitary landfill and its position relative to the trenches are shown on Plate 2.

The construction of the new landfill, generally a triangular area, was accomplished by leveling the ground surface over the trenches and diking the perimeter with material dredged by dragline from the surrounding area. As a result of this excavation, two crescent shaped "borrow pits" bordered the southwestern and northwestern sides of the newly developed landfill. On the eastern side, the landfill is bordered by the southern polishing pond. Plate 3 depicts the present geometry of the landfill.

The original basal dimensions of the triangular shaped landfill were approximately 450 feet by 450 feet by 450 feet. The basal elevation was approximately 22 to 23 feet above mean sea level (MSL).

At present the surface elevation of the landfill ranges from 55-60 feet above MSL.

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Subsequent to trench landfilling, solid wastes (typically trash and garbage) generated at Pratt and Whitney have been placed in the landfill. Disposal operations are facilitated by segmenting the entire landfill into two sections or "cells". Throughout the entire operation, one cell would receive wastes until, at capacity, the cell would be leveled and covered with soil material. Waste disposal would then proceed to the next cell until that cell was brought up to grade with waste and cover material.

The cover material, placed over each newly leveled waste cell, originated from various areas of Pratt & Whitney's site. When the sanitary landfill was first constructed, the aforementioned borrow pits were dredged to supply cover material. These borrow pits probably provided cover material for the first six or seven years of landfilling operations. The southwestern borrow pit was dredged a second time in order to provide cover material for the landfill when no other source was available. The borrow pits have been dredged to an approximate depth of 10 to 12 feet below land surface. It is also known that in the mid 1970's the southern polishing pond was dredged for cover material.

Since 1979, other sources of cover material have included soils excavated during construction of new facilities and borrow from drainage canals and the north polishing pond. The quantities and characteristics of these soils are unknown.

PREVIOUS INVESTIGATIONS

In 1980 and 1981 Dames & Moore conducted ground water investigations at Pratt & Whitney to identify the possible sources of volatile organic compounds (VOCs) contamination observed in the water supply. The investigations were primarily concerned with areas known to handle VOCs including the solvent still area, the solvent holding tank, and the sanitary landfill area. A final report prepared by Dames & Moore for Pratt & Whitney entitled Ground Water Contamination Study Water Supply Wellfield dated May 14, 1981, concluded that the landfill was not the source of contamination observed in the wellfield but rather identified the solvent tank and solvent still area as the source. This assessment was based on

ground water level and quality data collected from over 40 monitoring well clusters installed in the contaminated region.

High concentrations of VOCs were discovered in well D, therefore, seven monitoring well clusters (LF-1 through LF-7) were installed during the previous investigation around the sanitary landfill perimeter. Generally, only trace concentrations of VOCs (relative to observed concentrations in the well field) were detected in these wells. The locations of these wells are shown on Plate 3.

Based on soil permeability tests and water level measurements conducted in the landfill wells, ground water flow velocities were calculated to be very slow. It was estimated that it would take the contaminants approximately 4000 years to reach the nearest offsite, downgradient, water supply well located approximately 3 1/4 miles southeast of the site. This estimate was based on the assumption that aquifer properties remain constant between the landfill area and the noted well. In the vicinity of the landfill, it was estimated that it would require more than 50 years for the contaminants to reach the southern property line.

PRESENT LANDFILL INVESTIGATION

INTRODUCTION

The present landfill investigation was initiated in December of 1981 at the request of Pratt & Whitney. The primary purpose of the investigation was to identify various measures that would effectively control the migration of various ground water contaminants determined to be within the landfill area.

In order to determine the types of ground water contamination within the landfill and to assess the degree, extent, and movement of those contaminants, a ground water monitoring program was established surrounding the landfill area. The monitoring program consisted of a network of monitoring well clusters drilled into discrete zones of the shallow aquifer around the landfill. Typical well cluster construction is shown on Plate 4.

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During the installation of these wells, soil samples were collected and logged and permeability tests were conducted to identify the hydrogeologic properties of the shallow aquifer. Water quality data from these wells provided information necessary to identify the vertical and horizontal extent and degree of ground water contamination near the landfill area.

LANDFILL HYDROGEOLOGY

The subsurface geologic setting in the landfill area was defined by drilling soil borings at each monitoring well cluster location. Soil samples from these borings were collected and logged to;

1. define the landfill area stratigraphy;
2. delineate stratigraphic boundaries for monitoring well design, and;
3. identify the basal unit of the shallow aquifer underlying the landfill area.

Geology

The geology at Pratt & Whitney's landfill site is characterized by highly variable sandy strata. A schematic representation of the landfill geology is shown by the fence diagram on Plate 5. Plate 6 shows two cross sections of the landfill area geology not identified on the fence diagram. Generally, the strata contain high percentages of silt and clay and minor amounts of sandstone. In order of increasing depth the geologic units are as follows:

1. Sand; gray to brown, fine to medium grained quartz with traces of silt and clay and organic material. This layer averages two to five feet in thickness.
2. Sandy clay; brown, fine to medium grained with some silt. This layer averages one to four feet in thickness, and grades thicker from north to south.
3. Sand; light brown to brown, fine to medium grained quartz with silty sand and sandstone nodules. Thickness of this unit is quite variable and lenticular.

4. Sandstone; light brown to gray, shelly sandstone with silt and trace clay. The sandstone thickness is quite variable, averaging five feet and thinning toward the west.

5. Clay; dark brown, dense, organic, peaty clay with trace sand. This layer averages two to three feet in thickness beneath the entire landfill area and is considered the base of the shallow aquifer.

6. Sandy silt; gray to brown, fine to medium grained sandy silt with some clay and shell. This unit is probably the Caloosahatchee Marl.

The thickness of the surficial sediments, which comprise the shallow, water table aquifer in the landfill area is approximately 50 feet.

Shallow Aquifer Permeability

To assess the permeability of the shallow aquifer, falling head permeability and pumping tests were conducted on all landfill wells and several polishing pond wells. Tests were conducted in each monitoring well so that the horizontal permeability within discrete zones of the aquifer could be calculated. Many of the sediments beneath the landfill have high percentages of silts and clays. Therefore, these sediments have low permeabilities and ground water flow is restricted.

Table I shows the estimated horizontal permeability for each monitoring well tested, well construction information, and soil type present at each monitored interval.

The permeability values for all monitored zones generally ranges between 2 and 100 feet/day. The average horizontal permeability for the landfill area, estimated from 34 permeability tests, is approximately 25 ft/day. Based on soil type, the average horizontal permeability of shallow aquifer sediments are as follows: Silty and clayey sands, 10 ft/day; fine to medium grained sand, 46 ft/day; sandstone, 22 ft/day. The average soil type permeabilities do not correspond to the permeability of monitoring zones because more than one soil type may be present within a particular monitored interval.

Ground Water Elevations

During April, 1982, ground water elevations were measured at each of the landfill area monitoring wells. Generally, water levels were between 23.0 and 24.0 feet MSL. These elevations were probably more typical of wet season conditions because measurements were taken following a significant precipitation event which took place during the end of March. Ground water elevations declined at a rate of approximately 0.15 ft/week for three weeks following the precipitation event.

Water table contour maps constructed from these measurements are shown on Plates 7A, B, and C. This plate shows that the hydraulic gradient in the landfill area is relatively flat, as it is throughout all of the Pratt & Whitney site. The average gradient in the landfill area is approximately 0.001 or one foot of head difference over a horizontal distance of 1000 feet. Generally, this gradient remains constant throughout the year even though ground water elevations decline two to three feet from wet season to dry season.

Ground Water Flow

The ground water flow direction, in the landfill area, is generally towards the southwest. The flow direction is predominately due to the influence of the prevailing (southeast) regional hydraulic gradient, and the polishing pond. Water levels slope from a high in the immediate vicinity of the polishing pond, to lower elevations south and west of the landfill. This is due to the presence of a slightly elevated head within the polishing pond.

In the immediate vicinity of the landfill, a radial component to the ground water flow exists. This can be attributed to a slight "mounding" effect created by the landfill. The magnitude of the flow components created by the polishing pond and landfill decrease with distance from the source and the regional southeast gradient becomes the dominating flow component away from the landfill. Plate 7 shows that in the landfill vicinity, ground water movement from the polishing pond and landfill is initially to the

northwest, west and southwest. This radial component is then influenced by the regional southeast gradient.

The horizontal ground water flow velocity was calculated for each monitoring zone using a hydraulic gradient of 0.001 (field measured), and assuming a porosity of 0.25 (typical of average soil type) and the average aquifer permeability as determined for each monitoring zone. The calculated horizontal velocities ranged from 0.20 ft/day for the shallow depth wells to approximately 0.07 ft/day for the intermediate depth and deepest wells. Using the average of these three velocities (0.11 ft/day), it will take ground water in the landfill area approximately 30 years to reach the southern property boundary.

GROUND WATER QUALITY

Inorganic Constituents

Major Ions and Selected Parameters

Water quality analyses were conducted for the major ionic constituents (anions and cations) and other selected parameters present within the landfill monitoring well clusters, LF-8 through LF-12. Table II lists all of the parameters analyzed for this investigation, however, many of these parameters tested were not present. The analytical results, as they compare to the maximum allowable concentration in Class G-II waters, are shown on Table IIIa.

An effective way to interpret inorganic water quality data, particularly landfill water quality, where large changes in water chemistry are observed, is through the use of Stiff diagrams (Hem, 1970). This type of diagram is effective because when constructed, a distinct geometric pattern depicting the water quality in a well is formed. Stiff diagrams for landfill wells LF-8 through LF-12 and Well PW-17 (background) are shown on Plates 8a and b. The "background" sample, from monitoring well PW-17 located north of the manufacturing building, was chosen because the well was up gradient from areas contaminated with VOCs. Also, the observed

water quality was consistent with published shallow aquifer water quality data for other locations in Palm Beach County.

Comparatively, many of the Stiff diagrams (LF-8 b and c, LF-11 a, b, and c, LF-12 a, b, and c and PW-17) exhibit similarly shaped geometric patterns. The similarities indicate that the water quality in the landfill area is similar in quality to the background sample.

The monitoring wells exhibiting patterns not consistent with the background contain chemically altered waters influenced by the landfill leachate. The wells exhibiting the greatest deviation from the background pattern are LF-9 a, b, and c, LF-10 a, b, and c and LF-8 a. These wells are located around the northern base of the landfill perimeter and in the area of landfill trenches. The inorganic parameters which show the most significant deviation from background are chloride, calcium, sodium and potassium.

The ground water quality data for chlorides, total dissolved solids (TDS), pH, chemical oxygen demand (COD), and specific conductance are shown on Plates 9 through 13 and on Table III. Generally these plates indicate that a small area of contamination underlies the landfill. The extent of the contamination is generally limited to the immediate landfill and trench areas to the north. Within the leachate, concentrations of the aforementioned constituents are generally greater then the Florida standards for Class G-11 waters as shown on Table 111a. However, the concentrations decline radially away from the contaminated area and the constituents were analytically determined to be less than the State standards within the landfill perimeter wells, LF-1 through LF-4.

It is believed that the inorganic species making up the leachate are fairly immobile and have very slow migration rates due to the hydrodynamics and the ion exchange capacities of fine grained sediments identified in the landfill area.

Heavy Metals

As part of this investigation, fourteen (14) metal species, were analyzed from water samples collected from the landfill monitoring wells. The metals included arsenic, barium, cadmium, total chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium and zinc. Of the metal species analyzed, only manganese and iron were detected at concentrations greater than standards for Class G-II waters. The relationship between the State standards for metals in Class G-II waters and the analytical concentrations of metals detected in Pratt & Whitneys' Landfill wells is shown on Table IIIb. Manganese concentrations above State standards were detected in wells LF-8 (a and c), LF-9 (a, b and c), LF-10 a, LF-11 c and LF-12 c. Iron concentrations above State standards were detected in wells LF-9 (a and b). Generally, the concentrations of manganese and iron above State standards were detected in wells located north of the landfill in the former trench landfilling area.

As a result of the relatively low concentrations detected for most dissolved metals, metal concentrations were totalized and are shown on Plate 14 and Table III/b. Because of the relatively low concentrations and limited areal extent of dissolved metals in the landfill area, dissolved metals are probably being affected by attentuation mechanisms. These mechanisms include cation exchange with clays, chelation, adsorption and precipitation, which can limit their movement.

Organic Constituents - Volatile Organic Compounds

For simplicity of discussion, the VOCs, analytically identified, will be referred to as total VOCs. A complete breakdown of the individual VOC species concentrations appear on Table IV. Plate 15 shows the areal variability of VOC concentration within the shallow, intermediate and deep landfill monitoring wells. Significant VOC concentrations were found only at well clusters LF-9, and LF-10 and in well D. Well LF-9b had the highest VOC concentration, approximately 600,000 parts per billion.

The highest concentrations of VOCs occur north of the landfill, strongly suggesting the source of VOCs to be the trenches beneath and/or north of the landfill. High concentrations of VOCs may extend beneath the landfill. However, this was not verified because it would require drilling through the landfill, an environmentally unsound practice.

Vertically, the data shows that the deep portions of the aquifer are more contaminated than the shallow zones. This is particularly true when comparing the shallowest wells to the deepest wells. The movement or "migration" of the VOCs is very slow and is, in part, a function of density differences between water and VOCs. This is supported by the limited areal extent of highly concentrated contaminants. The attenuation mechanisms affecting VOC concentrations are probably molecular absorption, and dilution.

Interpretation of Water Quality Data

The water quality results, for samples collected from Pratt & Whitney's network of landfill monitoring wells, indicated that the landfill area, as a whole, has only very low levels of contamination of a limited extent. One region beneath the northern portion of the landfill (a former trench area) continually exhibits higher than background levels of VOCs and some inorganic constituents. This strongly supports the contention that the main source for all contamination observed within monitoring well clusters in that area (LF-9, LF-10, Well C and Well D) is the trench area.

The water quality data gathered to date indicate that the landfill leachate is almost stagnant, even though the regional gradient is generally from northwest to southeast. The slow ground water flow rate is caused by the polishing pond southeast of the landfill and perhaps the borrow canals south and west of the landfill which act as hydraulic barriers. This is particularly true for the polishing pond because of maintenance of an elevated head above ground water levels. The average ground water elevation in the landfill area is approximately 23.5 feet MSL. The landfill, which probably has a slight ground water mound, actually lies between two

opposing hydraulic forces, the regional gradient and polishing pond. The ground water flow, away from the landfill, is then skewed by those forces.

Leachate movement is probably also affected by other processes such as ion exchange, molecular adsorption, chelation and precipitation which tend to impede its movement by removing it from the flow system. These factors are known to affect most inorganic constitutents but relatively little is known about their affects on VOCs.

With regard to the State water quality standards for Class G-II waters, a breakdown of the leachate constituents per well shows that a few constitutents occur above the standards in wells immediately adjacent to the northern portion of the landfill, the region of landfill trenches. Concentrations of leachate constituents away from this region decrease rapidly and are within Class G-II standards in the perimeter landfill area wells LF-1 through LF-4. The low concentrations observed in these wells verify the slow migration rate and/or attenuation of the landfill leachate.

The ultimate fate and destination of the contaminants is dependent upon the magnitude of several factors acting on the leachate. Lithologically, the shallow aquifer in the landfill area contains appreciable amounts of fine sand, silt and some clay and sandstone of low permeability. The base of the shallow aquifer is marked by a low permeability organic clay layer. Ground water flow and leachate migration is therefore significantly impeded by these factors. Because the shallow aquifer contains silt and some clay, many inorganic constituents will probably become complexed (adsorbed, chelated and so forth) by these sediments and removed from the ground water.

CONCLUSIONS AND RECOMMENDATIONS

The Pratt & Whitney landfill investigation developed a broad data base which included information on the landfill; chronology, area hydrogeology, and water chemistry. Based on this information, it appears that Pratt & Whitney's landfill and associated ground waters do not represent an eminent human health hazard now or in the foreseeable future. The water

quality data identified a small area of contamination beneath and to the north of the landfill. The degree and areal extent of the contamination are quite limited and dependent upon several mechanisms controlling the movement and attenuation of the leachate. The mechanisms include but are probably not limited to seasonal fluctuations in rainfall, hydraulic barriers associated with the regional gradient and the polishing pond, as well as, adsorption, chelation, and precipitation processes.

The Stiff diagrams indicate that the area of greatest contamination is located generally under the landfill and beneath the trench area north of the landfill. This interpretation is also supported by contaminant concentration diagrams for VOCs, metals, chlorides, pH, COD, TDS and specific conductance. The landfill trenches utilized between 1958 and 1972 appear to be the sources of the leachate because the contents were disposed beneath the water table. The present day landfill contents are raised well above the water table and probably contribute minor amounts of leachate.

The landfill trenches have been in existence for over 25 years yet the leachate has remained essentially in the same area. Because the trenches were excavated below the water table, the potential for leachate generation existed from the beginning. Despite this, the leachate has shown little movement. The transport of the leachate within the aquifer is being inhibited by the opposing hydraulic forces and the low permeability nature of the soils. The low permeability of the soil will also inhibit rapid removal of the leachate from the aquifer by artificial means such as pumping.

Containment of the leachate will require a hydraulic barrier system. Such a system should be designed to prevent the further migration of leachate remaining beneath the landfill. The hydraulic barrier should be capable of overcoming the hydraulic forces affecting the leachate without segmenting or isolating portions of the contamination.

A series of low volume pumping wells placed in strategic locations around the western side of the landfill would make an effective hydraulic barrier

PRT 001

and would remove leachate from beneath the landfill at a slow but steady rate. The design of the hydraulic barrier system will be predicated upon information derived from pumping tests, a computer modelling effort and analysis. The final design of the hydraulic barrier system will probably consist of three or four low volume pumping wells surrounding the landfill. Dames & Moore in conjunction with Pratt & Whitney is proceeding with this design.

Because the chemical make-up of the leachate is essentially VOCs renovation and disposal of the recovered leachate will be facilitated by utilizing an aeration treatment system and percolation/evaporation ponds. The aeration system which will be designed by Pratt & Whitney is similar in design to the aeration system for their potable water supply system, and thus should remove greater than 99 percent of the VOCs from the leachate prior to disposal. Disposal of the renovated leachate will be accomplished through the use of percolation/ evaporation ponds. The percolation ponds will be designed to dispose of the renovated leachate at a rate significantly greater than the recovery rate of the leachate. This should prevent the renovated leachate from overflowing the pond dikes during periods of extreme rainfall.

Dames & Moore recommends that Pratt & Whitney monitor the quality of the renovated leachate on a frequent basis depending on the rate of recovery, renovation, and disposal. In addition, continued periodic monitoring of various landfill area wells is recommended in order to monitor any potential for migration of the leachate.

Respectfully submitted,

DAMES & MOORE

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Partner

Mark R. Stephens, P.G.
Senior Hydrogeologist

CPG/MRS:jl/NR4

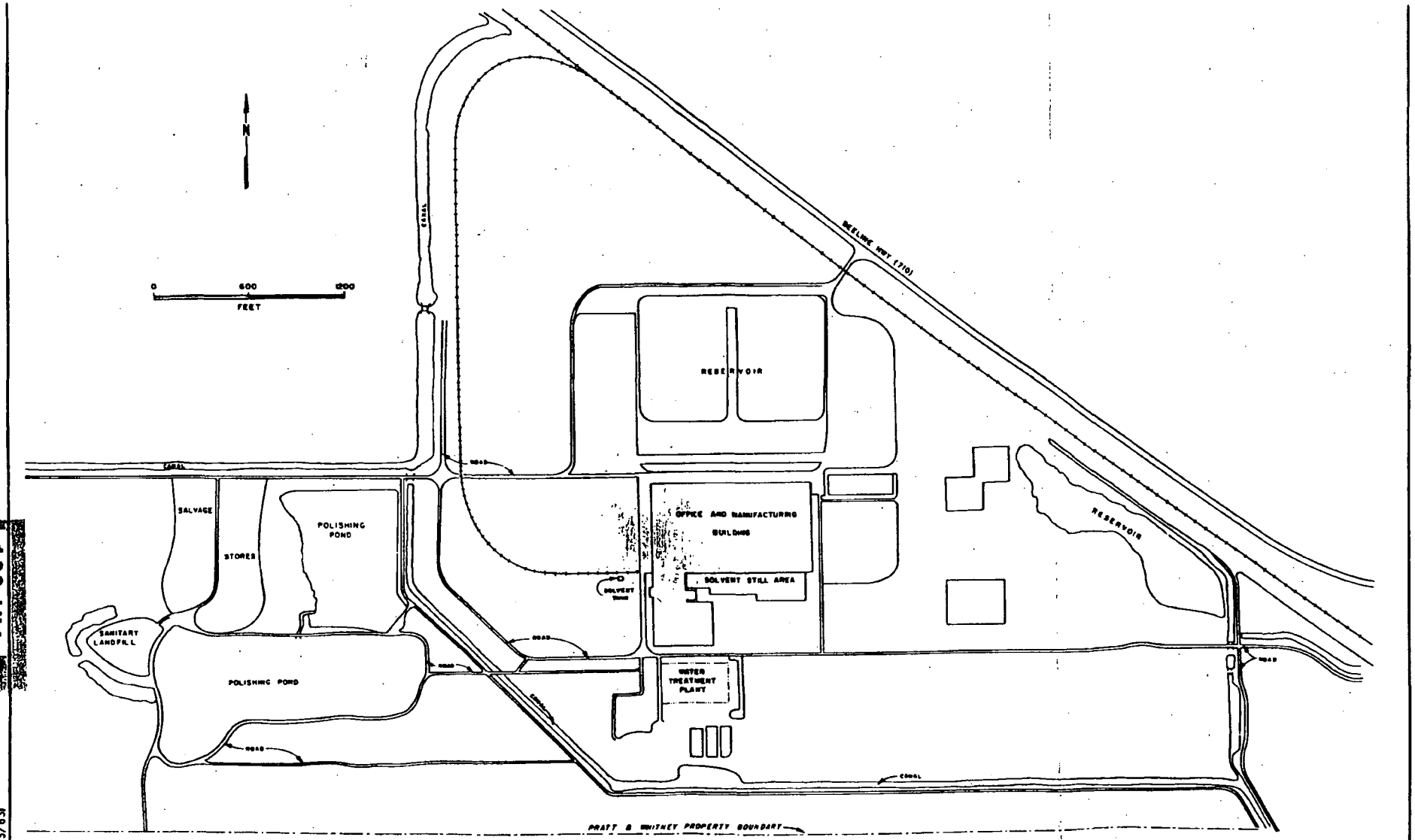
PRT 001

REFERENCES

Hem, J. D., 1970, Study and interpretation of chemical characteristics of natural water: U.S.G.S. Water-Supply Paper 1473, 363 p.

Schroeder, M. C., Milliken, D. L., and Love, S. K., 1954, Water resources of Palm Beach County, Florida: Florida Bureau of Geol. Rept. of Invest. No. 13, 63p.

United States Department of Agriculture, Soil Conservation Service 1978, Soil Survey of Palm Beach County Area, Florida.



SITE PLAN

PRT 001

PROJECT: PRATT & WHITNEY LANDFILL
LOCATION: PALM BEACH CO., FLORIDA

DAMES & MOORE
PLATE 1

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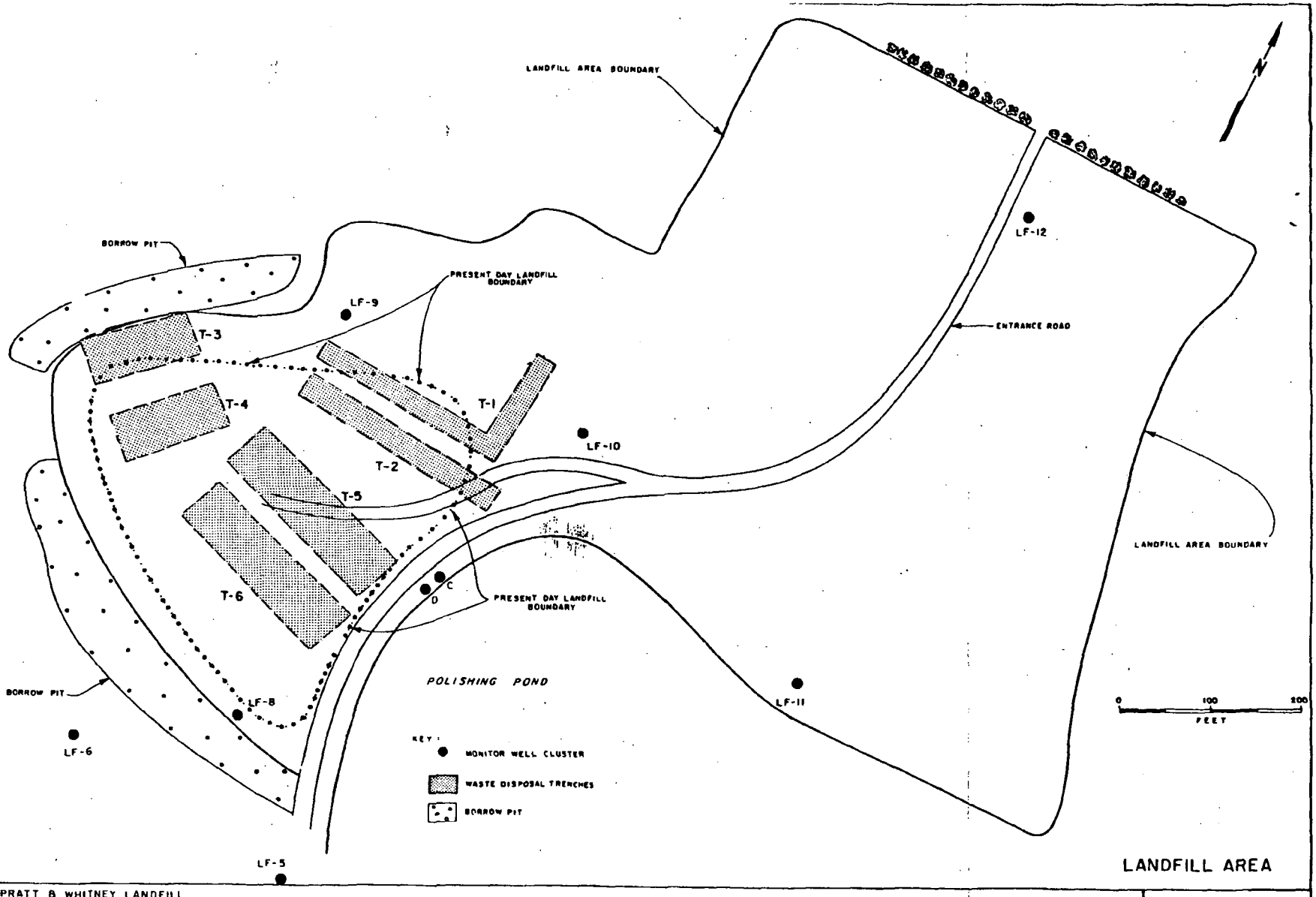
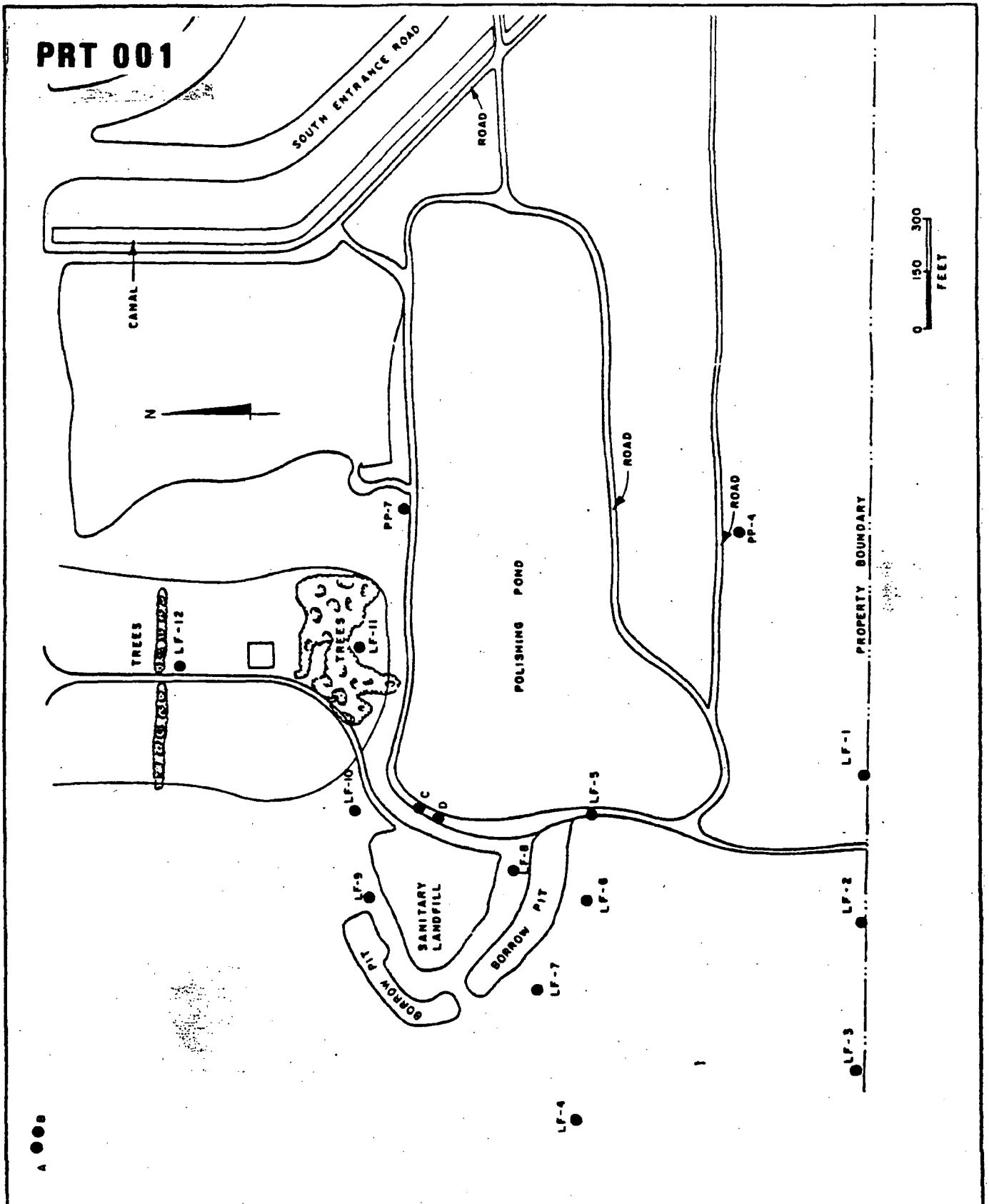

LANDFILL AREA BOUNDARY
BORROW PIT
PRESENT DAY LANDFILL BOUNDARY
LF-9
T-3
T-4
T-1
T-2
T-5
T-6
LF-10
LF-12
ENTRANCE ROAD
LANDFILL AREA BOUNDARY
LF-7
C
D
PRESENT DAY LANDFILL BOUNDARY
BORROW PIT
LF-8
LF-6
POLISHING POND
LF-11
0 100 200
FEET
KEY :
MONITOR WELL CLUSTER
WASTE DISPOSAL TRENCHES
BORROW PIT
LF-5
LANDFILL AREA
PROJECT : PRATT & WHITNEY LANDFILL
LOCATION : PALM BEACH CO., FLORIDA
DAMES & MOORE
PLATE 2



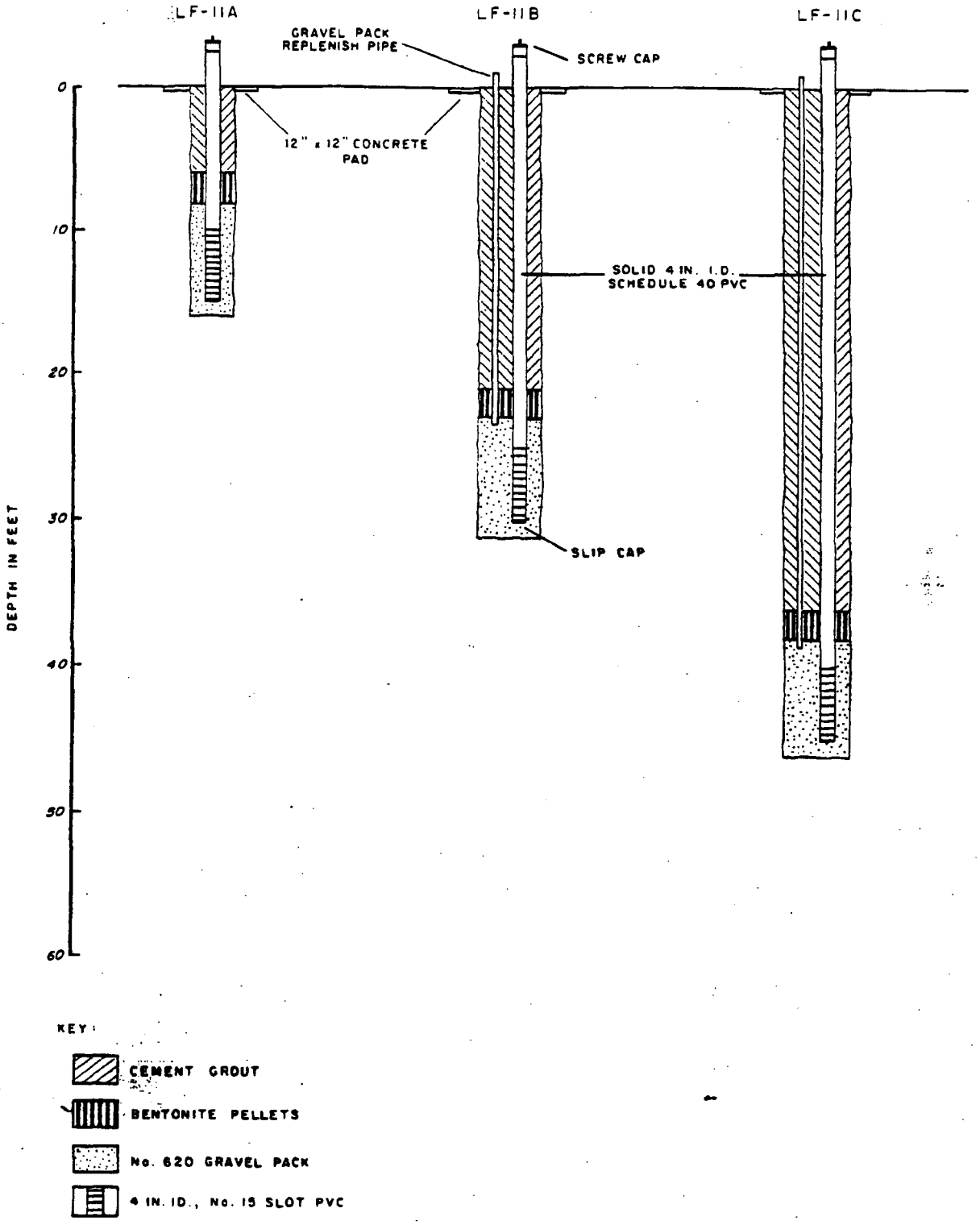
MONITORING WELL LOCATION PLAN

PROJECT : PRATT & WHITNEY LANDFILL
LOCATION : PALM BEACH CO., FLORIDA

DAMES & MOORE
PLATE 3

12038001026 12/83

PRT 001



TYPICAL MONITORING WELL CLUSTER

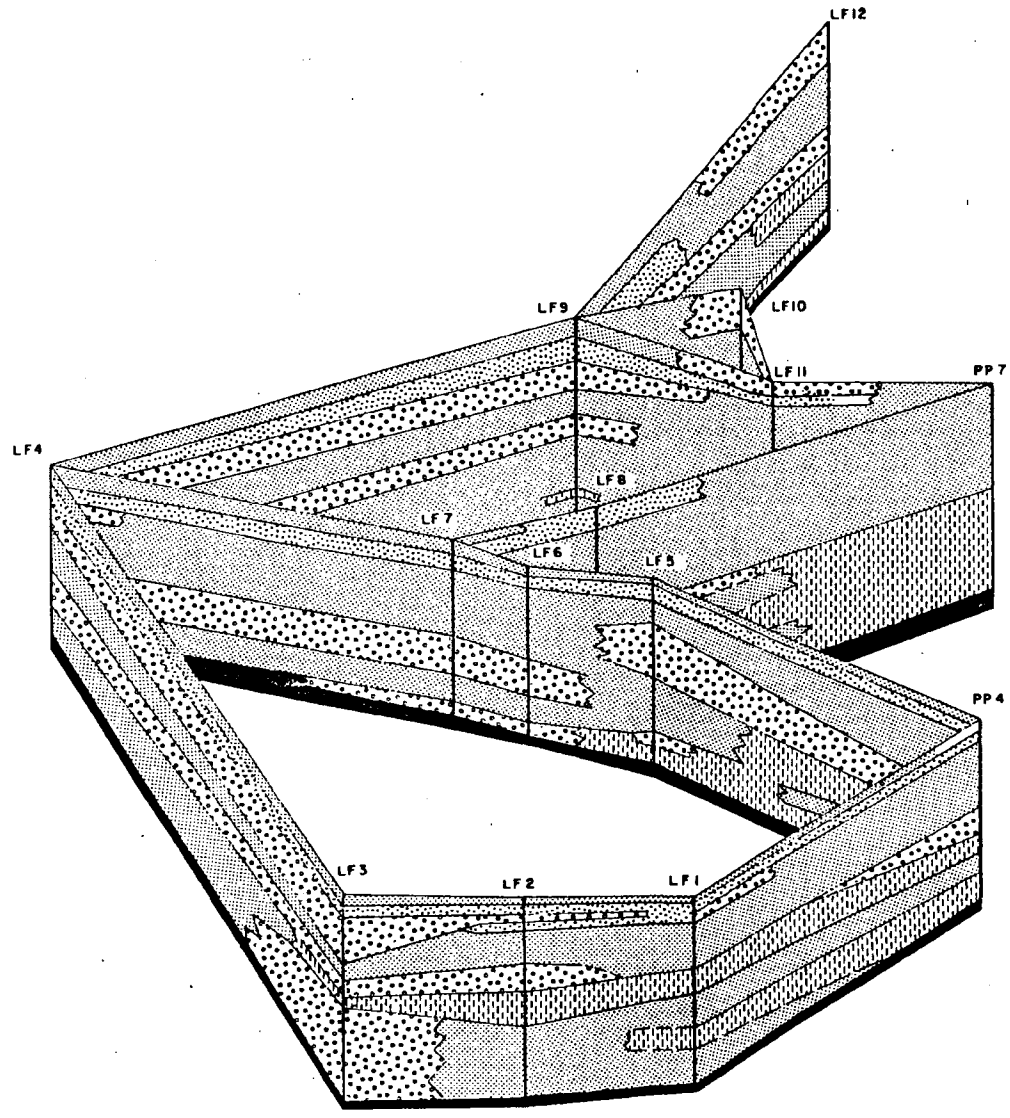
PROJECT : PRATT & WHITNEY LANDFILL
LOCATION : PALM BEACH CO., FLORIDA

DAMES & MOORE
PLATE 4

1203801026(4/82)

REVISIONS
BY _____ DATE _____
BY _____ DATE _____

CHECKED BY _____ DATE _____
APPROVED BY _____ DATE _____



KEY

- SAND, FINE TO MEDIUM GRAINED
- SANDSTONE FRIABLE
- SILTY SAND
- CLAYEY SAND, WITH SILT
- ORGANIC CLAY

0 300 600
HORIZONTAL SCALE IN FEET

NOTE :
WELL LOCATIONS ON PLATE 3

STRATIGRAPHIC FENCE DIAGRAM
LANDFILL AREA

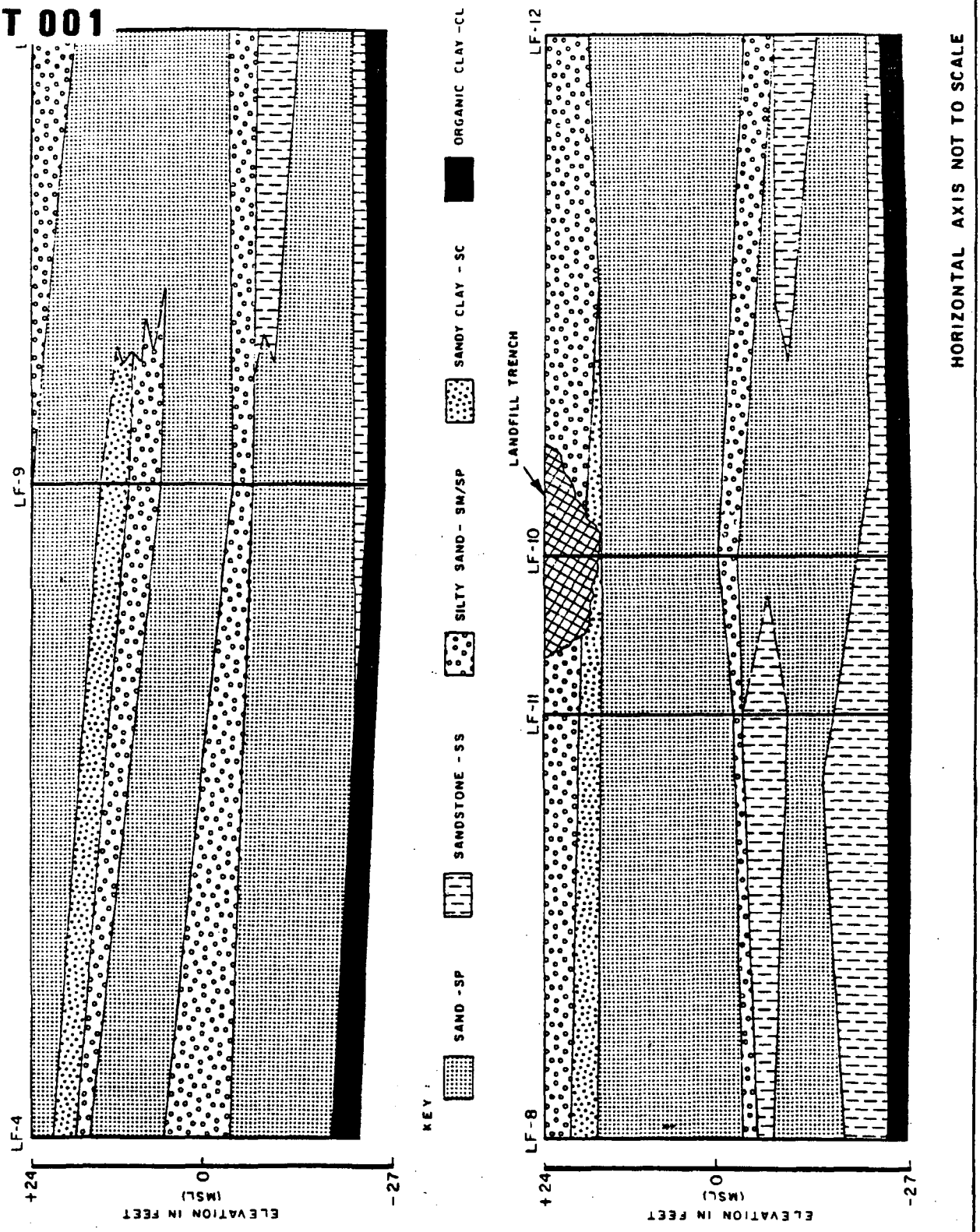
PROJECT : PRATT & WHITNEY LANDFILL
LOCATION : PALM BEACH CO., FL.

DAMES & MOORE
PLATE 5

PRT 001

12038008261 5-82

PRT 001



LANDFILL AREA STATIGRAPHIC CROSS-SECTIONS
WELLS LF-4 TO LF-12 AND LF-8 TO LF-12

NOTE:
WELL LOCATIONS ON PLATE 3

PROJECT: PRATT & WHITNEY LANDFILL
LOCATION: PALM BEACH CO., FLORIDA

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PLATE 6

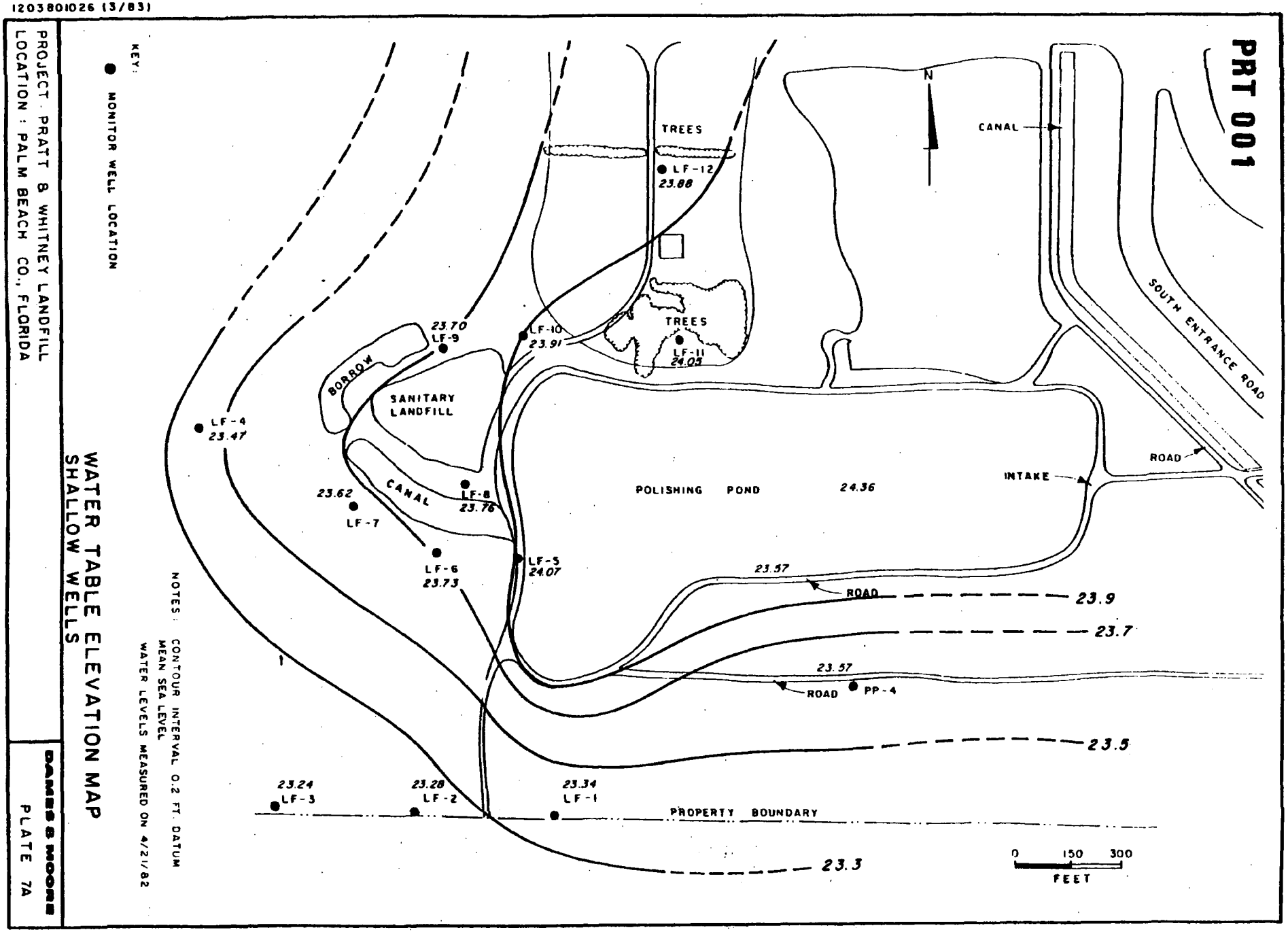
BY _____ DATE 3/15 CHECKED _____ DATE _____ APPROVED _____ DATE _____

12038010261(2/83)

BY _____ DATE 3/83 CHECKED _____ DATE _____ APPROVED _____ DATE _____

1203801026 (3/83)

PRT 001



WATER TABLE ELEVATION MAP
SHALLOW WELLS

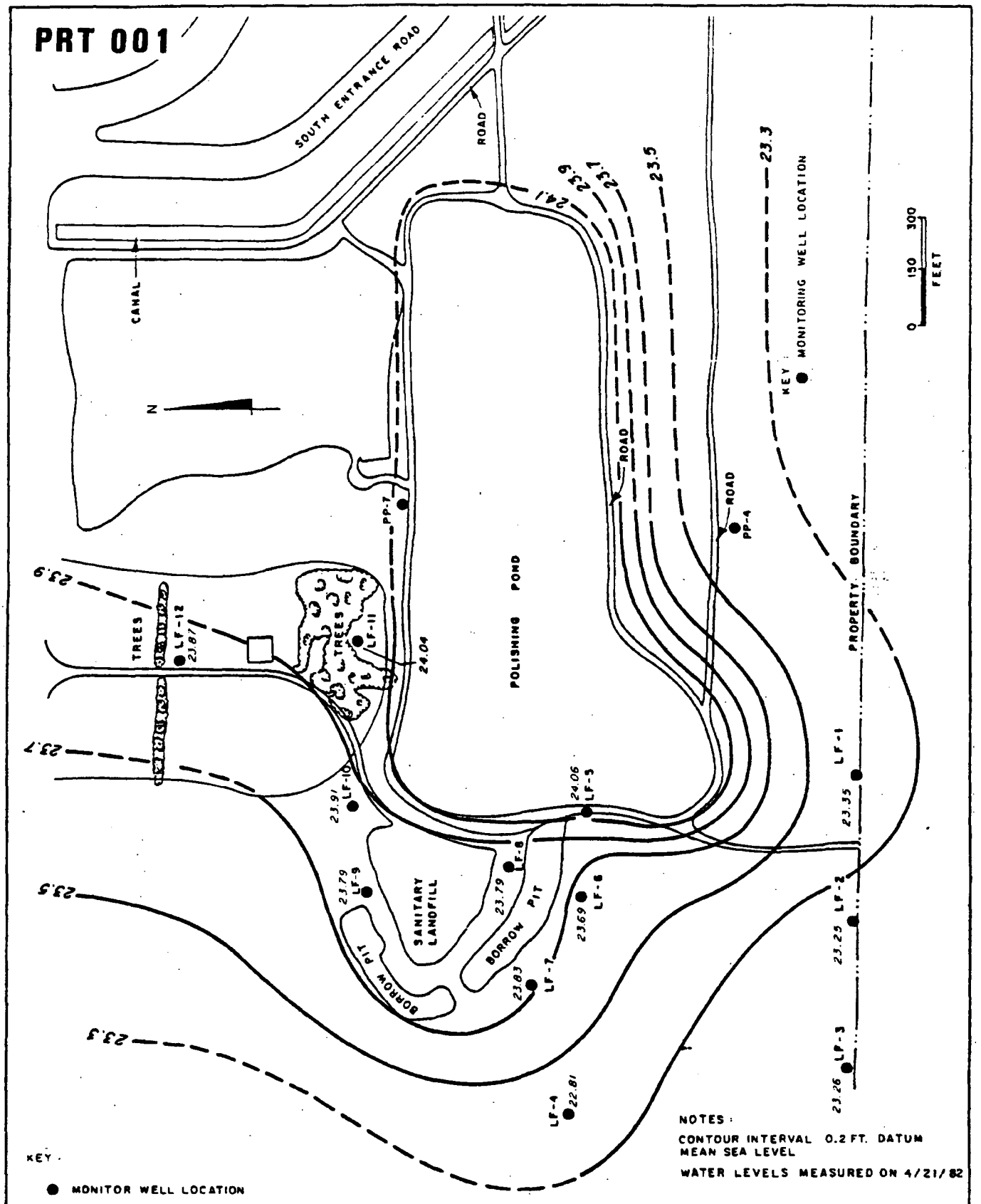
NOTES: CONTOUR INTERVAL 0.2 FT. DATUM MEAN SEA LEVEL
WATER LEVELS MEASURED ON 4/21/82

PROJECT: PRATT & WHITNEY LANDFILL
LOCATION: PALM BEACH CO., FLORIDA

DAMES & MOORE

PLATE 7A

PRT 001



WATER TABLE CONTOUR MAP
INTERMEDIATE WELLS

PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH , CO. , FLORIDA

DAMES & MOORE
PLATE 7B

BY _____ DATE _____ CHECKED _____ DATE _____ APPROVED _____ DATE _____

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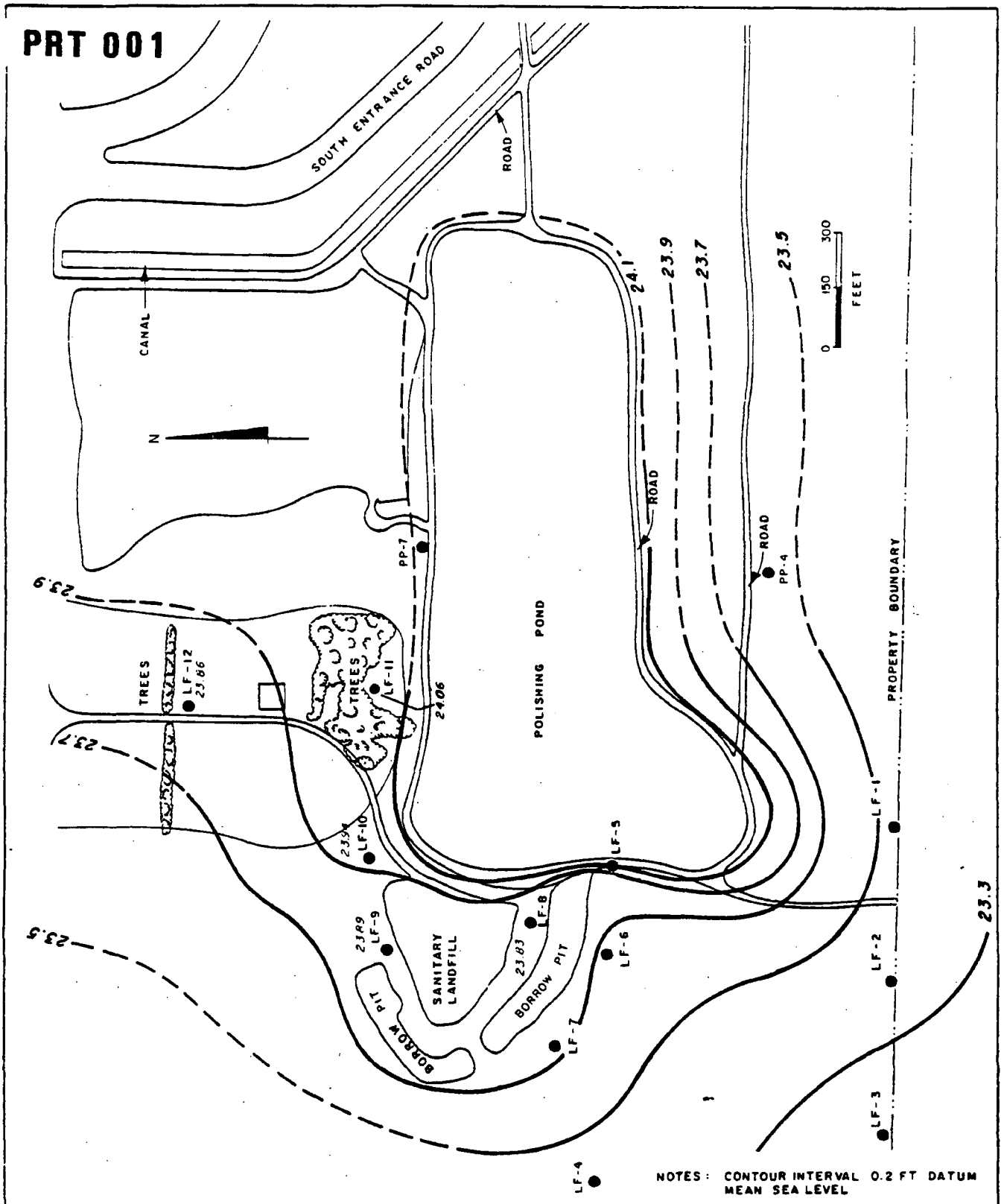
PRT 001



NOTES: CONTOUR INTERVAL 0.2 FT DATUM MEAN SEA LEVEL

WATER LEVELS MEASURED ON 4/21/83

KEY:

● MONITOR WELL LOCATION

WATER TABLE CONTOUR MAP
DEEP WELLS

PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH, CO., FLORIDA

DAMES & MOORE
PLATE 7C

BY _____ DATE 2/83 CHECKED _____ DATE _____ APPROVED _____ DATE _____

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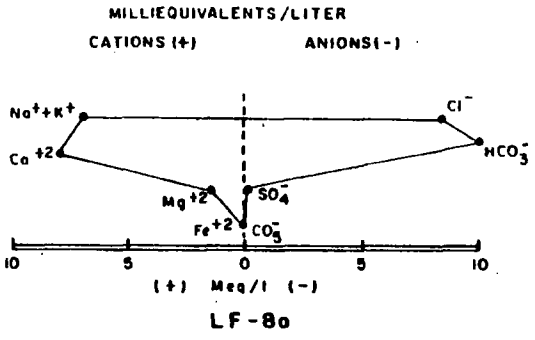
BY _____ DATE _____ CHECKED _____ DATE _____ APPROVED _____ DATE _____

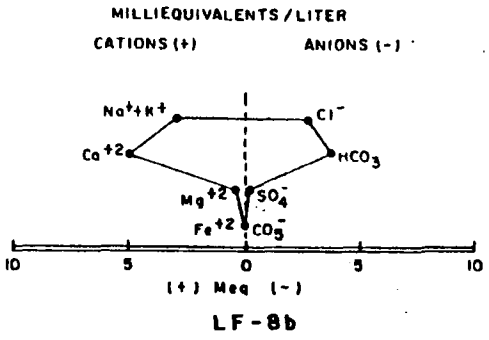
1203801026 (2/83)

PRT 001

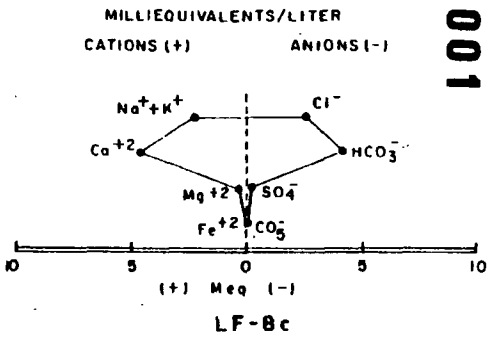
PROJECT : PRATT & WHITNEY LANDFILL
LOCATION : PALM BEACH, CO., FLORIDA



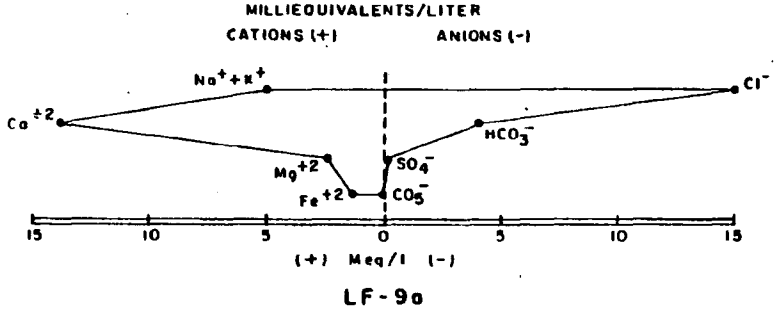
LF-8a



LF-8b



LF-8c



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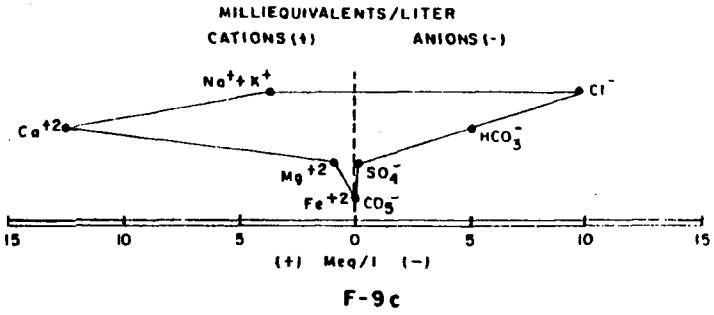
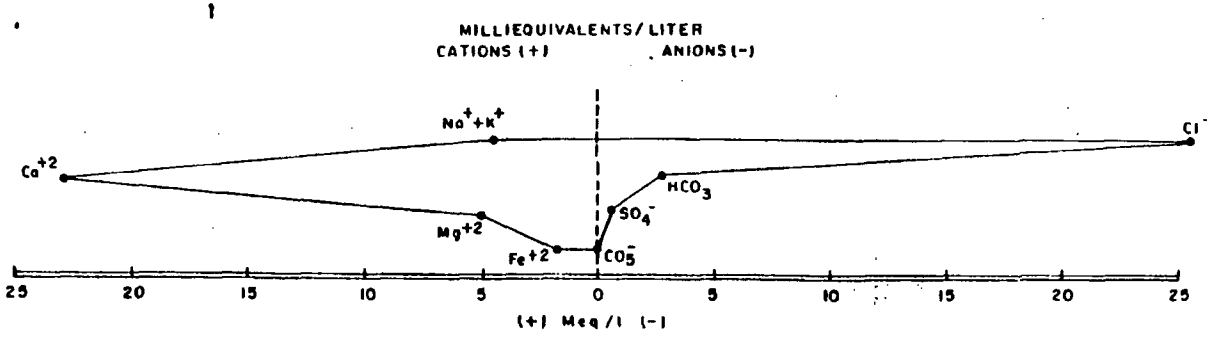
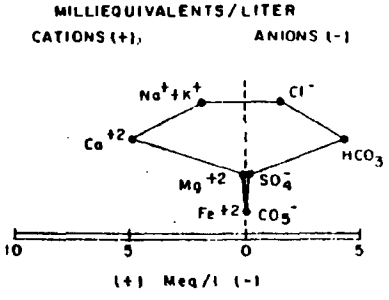


F-9c

STIFF DIAGRAMS
WELLS LF-8, LF-9 and PW-17



LF-9b



PW-17
(BACK GROUND WELL)

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PLATE 8A

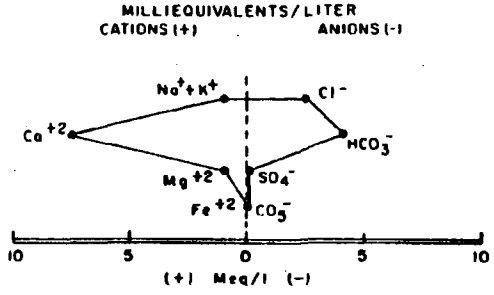
BY _____ DATE 2/83 CHECKED _____ DATE _____ APPROVED _____ DATE _____

1203801026 (2/83)

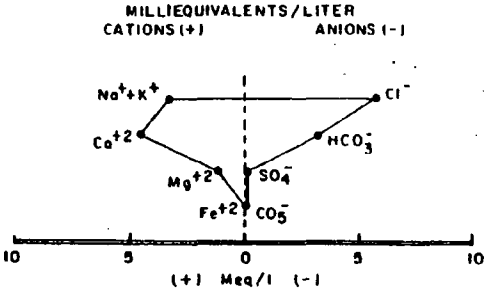
PRT 001

PROJECT: PRATT & WHITNEY LANDFILL
LOCATION: PALM BEACH CO., FLORIDA

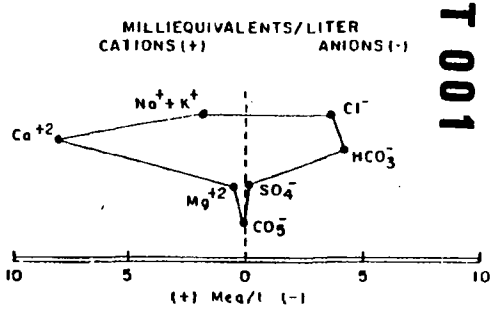
STIFF DIAGRAMS
WELLS LF-10 TO LF-12



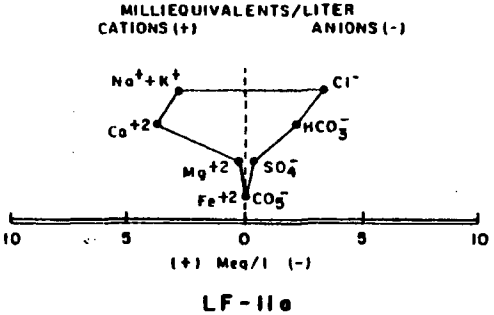
LF-10a



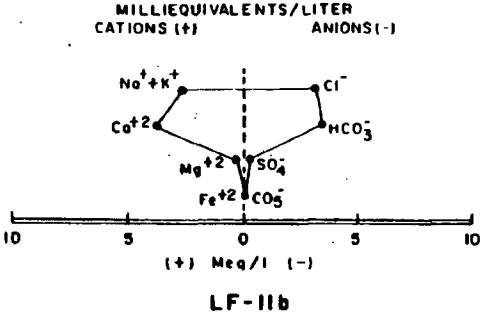
LF-10b



LF-10c



LF-11a



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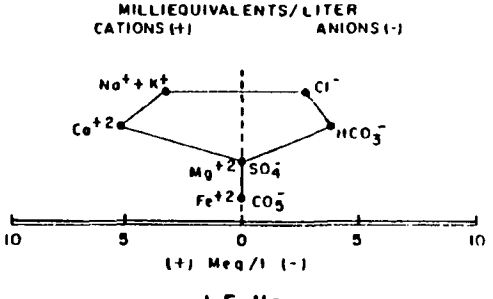
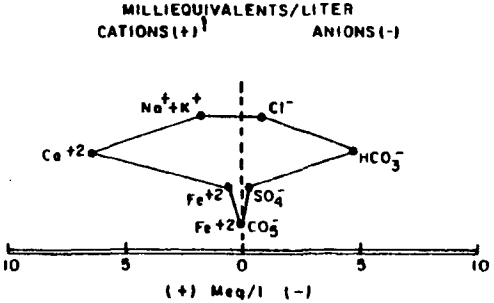


LF-11c



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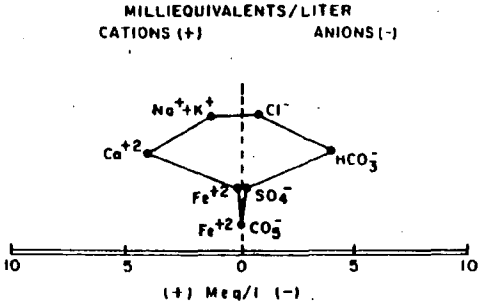

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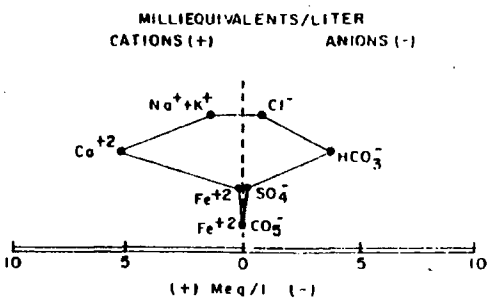

LF-12c

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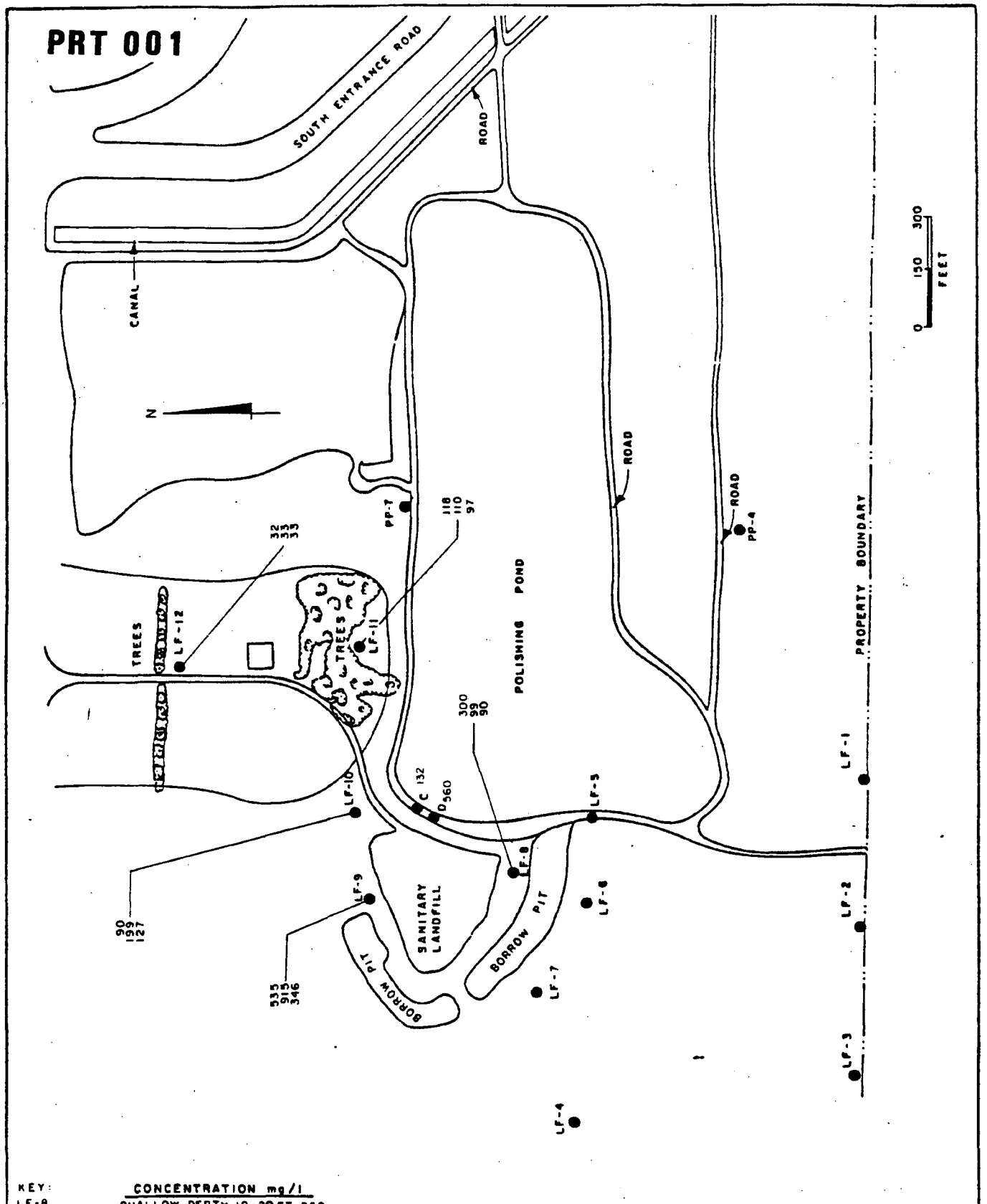
PLATE 8B



KEY:
LF-8

CONCENTRATION mg/l
SHALLOW DEPTH 10-20 FT. BGS
INTERMEDIATE DEPTH 25-35 FT. BGS
DEEPEST DEPTH 35-50 FT. BGS

CHLORIDE CONCENTRATION

PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH , CO. , FLORIDA

DAMES & MOORE
PLATE 9

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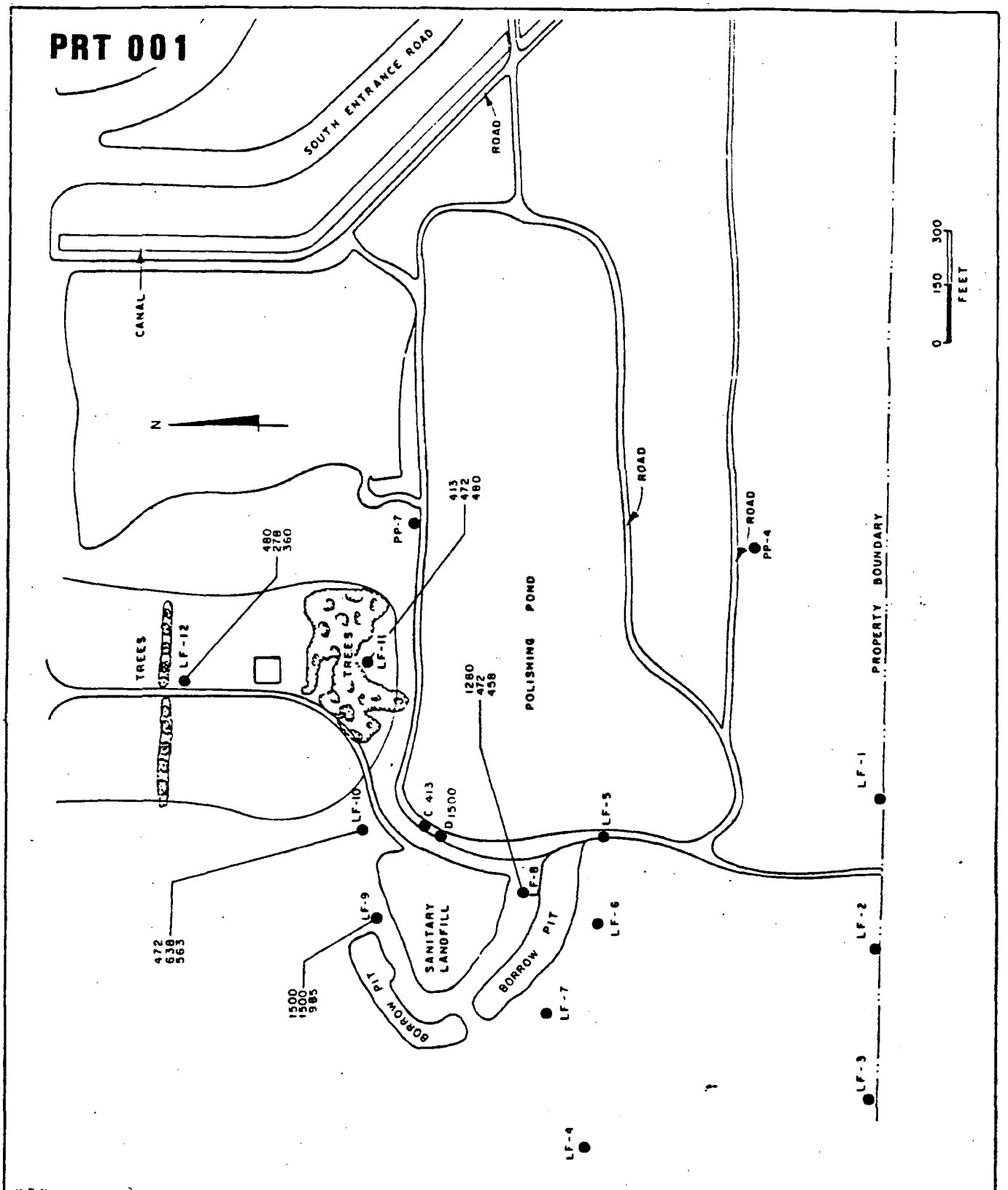
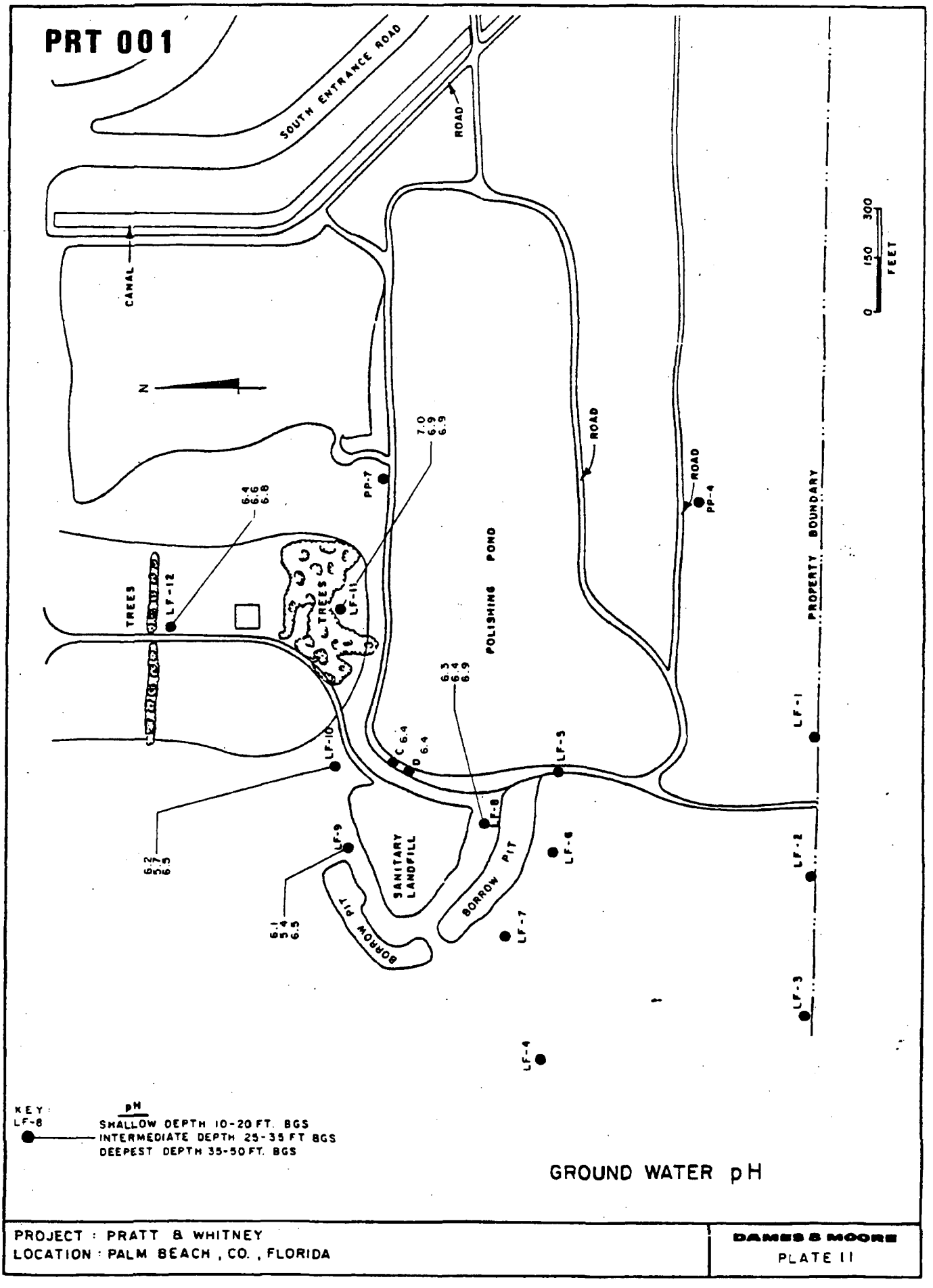


TOTAL DISSOLVED SOLIDS

PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH , CO. , FLORIDA

DAMES & MOORE
PLATE 10

12038102615/831



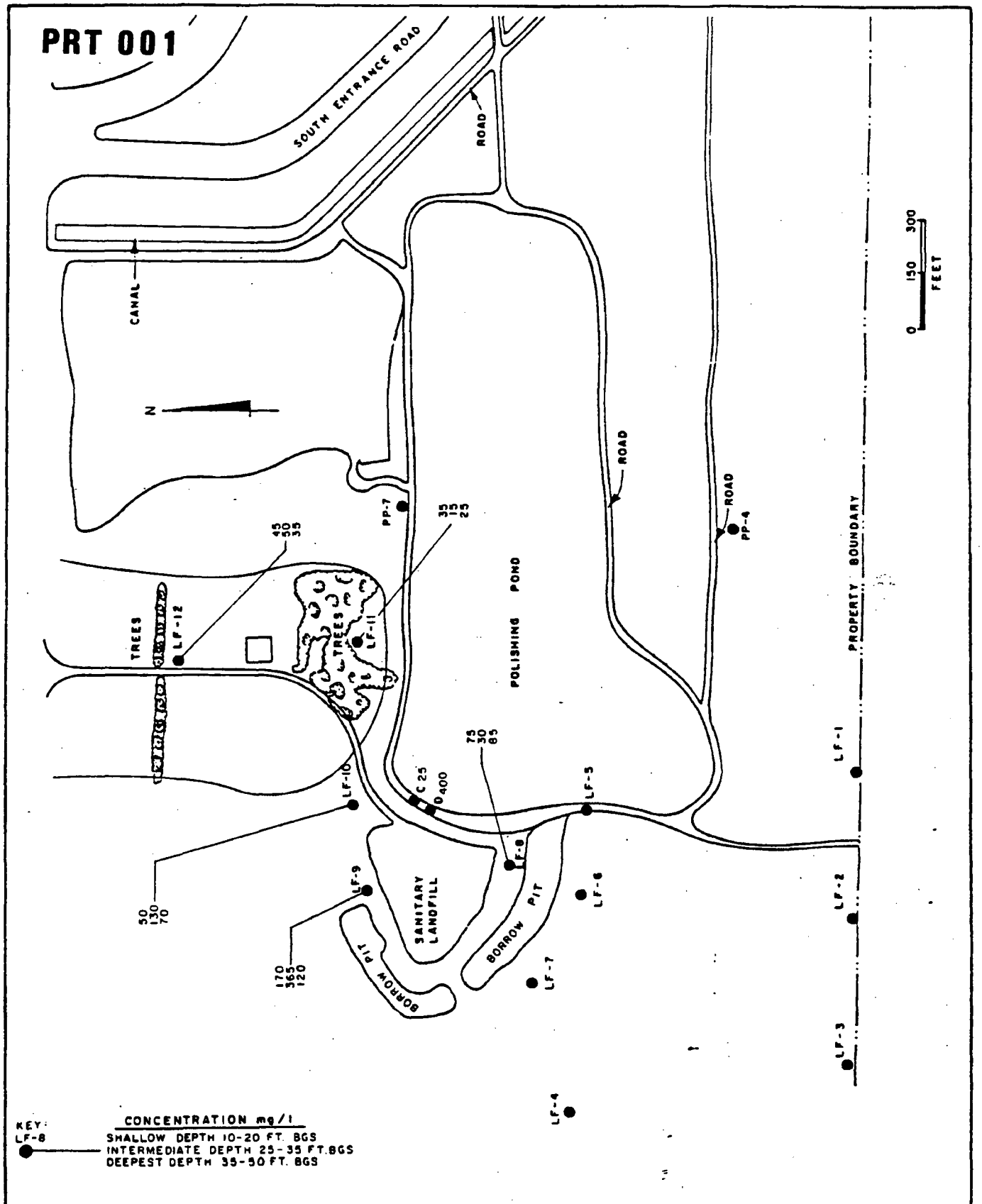
GROUND WATER pH

PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH , CO. , FLORIDA

DAMES & MOORE
PLATE II

12038010261 5/83)

PRT 001



KEY:
LF-8

CONCENTRATION mg/l
SHALLOW DEPTH 10-20 FT. BGS
INTERMEDIATE DEPTH 25-35 FT.BGS
DEEPEST DEPTH 35-50 FT. BGS

CHEMICAL OXYGEN DEMAND

PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH , CO. , FLORIDA

DAMES & MOORE
PLATE 12

DATE 3

BY

DATE

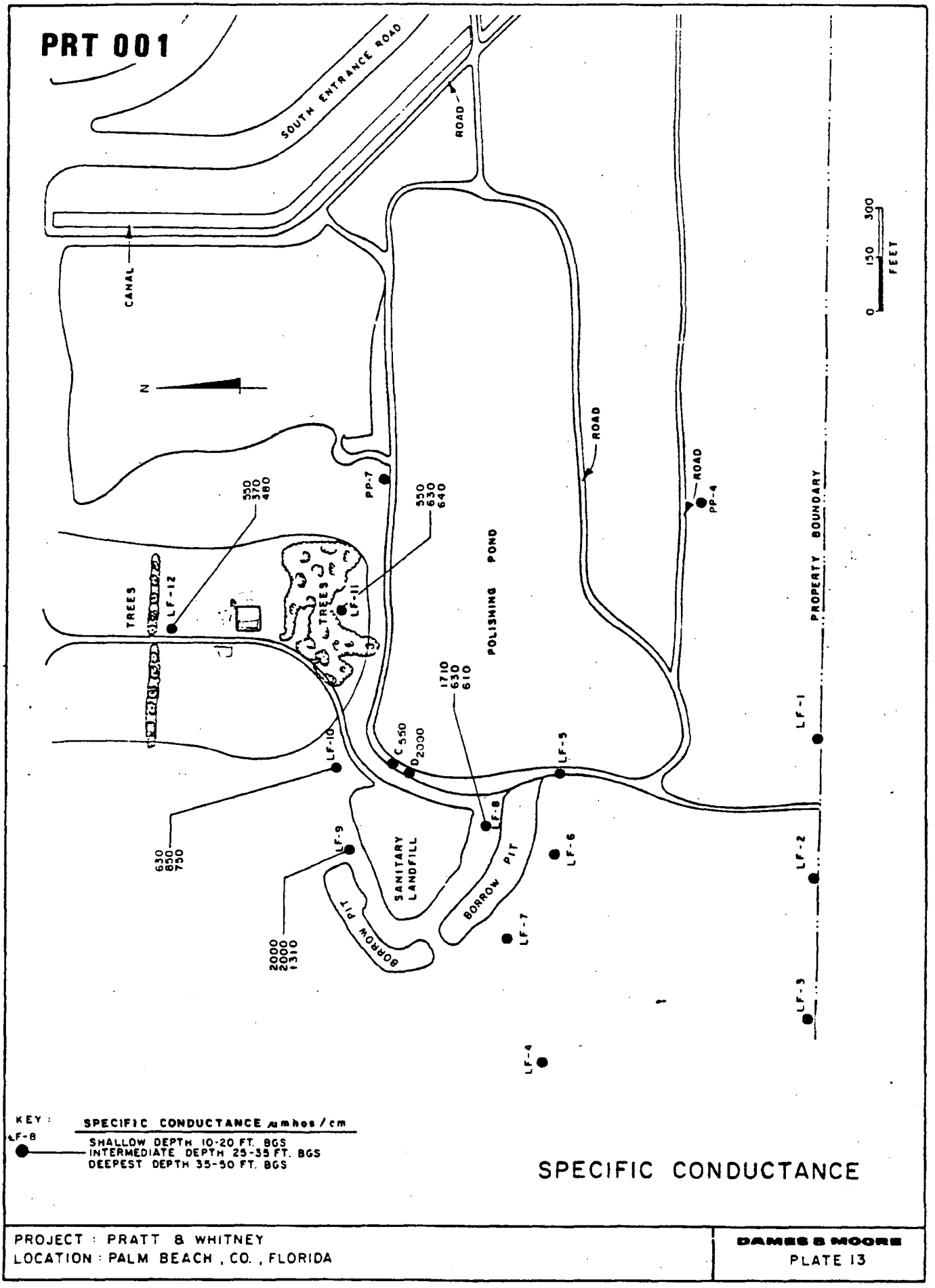
CHECKED

DATE

APPROVED

DATE

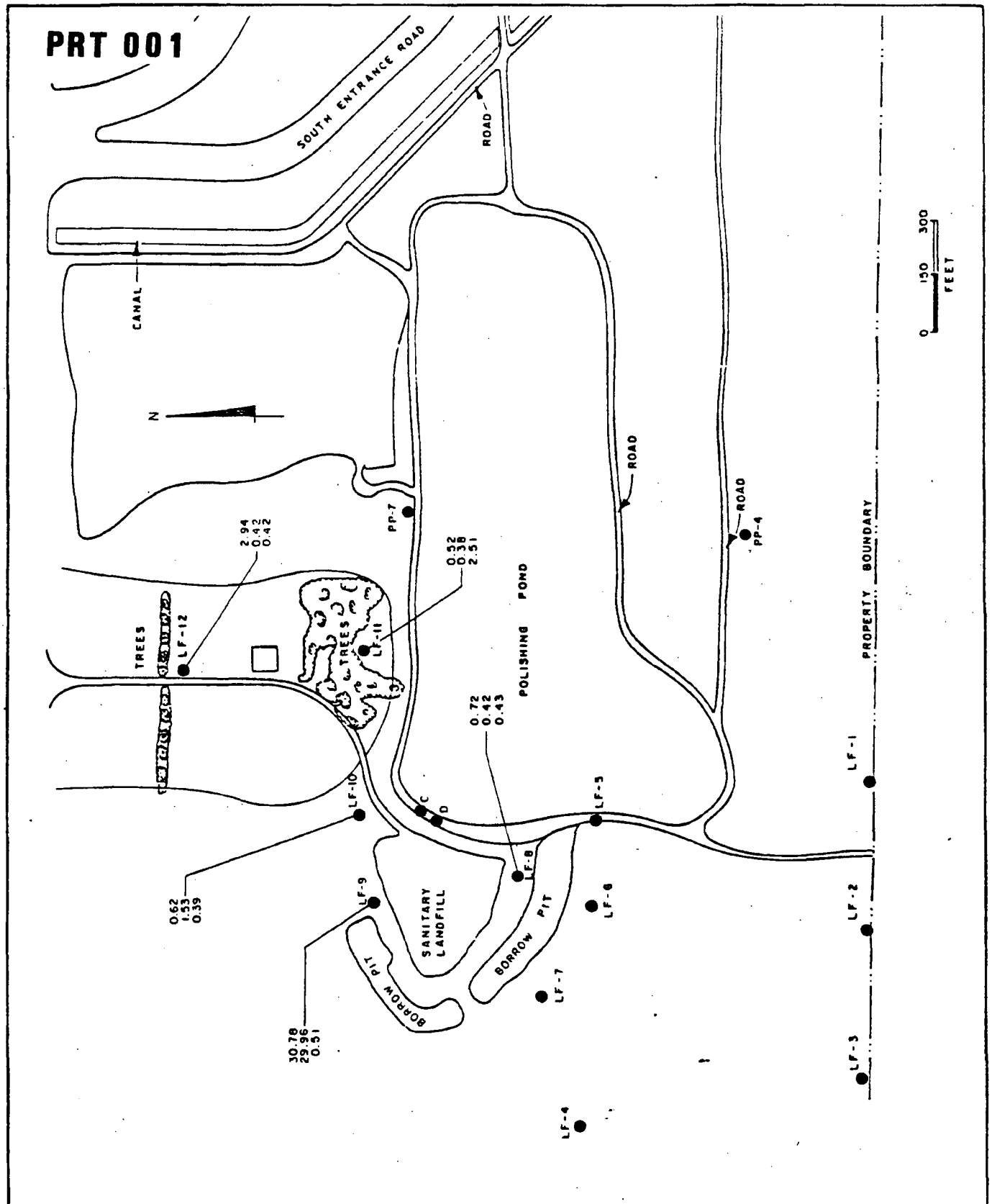
12038010261(5/83)

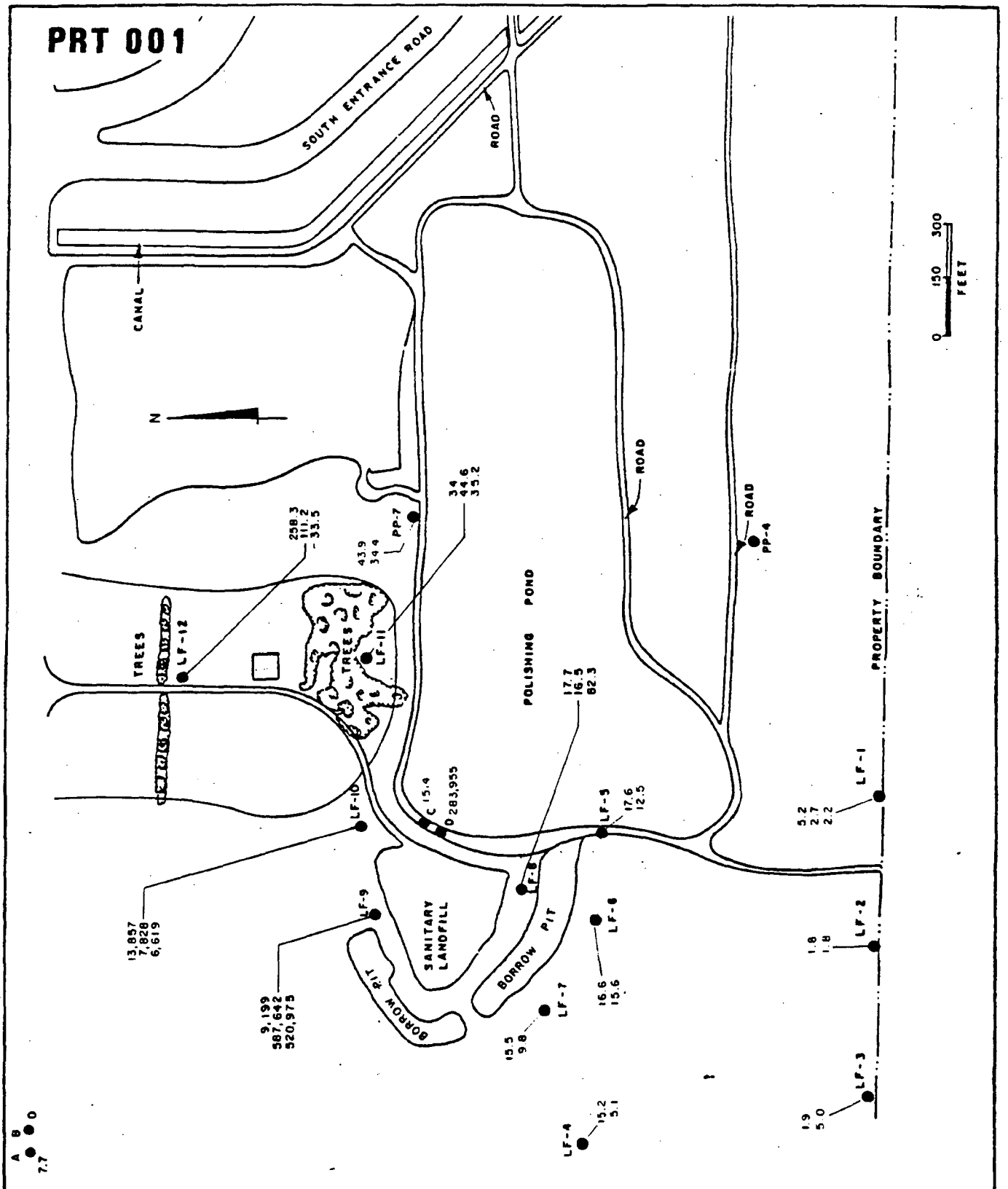


PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH , CO. , FLORIDA

DAMES & MOORE
PLATE 13

12038010261(5/83)


PRT 001
SOUTH ENTRANCE ROAD
ROAD
CANAL
N
ROAD
ROAD
PP-7
PP-4
2.94
0.42
0.42
0.52
0.38
2.51
TREES
LF-12
TREES
LF-11
POLISHING POND
0.72
0.42
0.43
PROPERTY BOUNDARY
LF-1
LF-10
C
D
LF-5
LF-8
0.62
1.53
0.39
LF-9
SANITARY LANDFILL
BORROW PIT
LF-6
BORROW PIT
LF-7
LF-2
30.78
29.96
0.51
LF-3
LF-4
0
150
300
FEET
KEY:
LF-8
CONCENTRATION mg/l
SHALLOW DEPTH 10-20 FT. BGS
INTERMEDIATE DEPTH 25-35 FT. BGS
DEEPEST DEPTH 35-50 FT. BGS
TOTAL METAL CONCENTRATION
PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH , CO. , FLORIDA
DAMES & MOORE
PLATE 14
12038010261S/B31



KEY:
LF-8 — CONCENTRATION µg/l
SHALLOW DEPTH 10-20 FT. BGS
INTERMEDIATE DEPTH 25-35 FT. BGS
DEEPEST DEPTH 35-50 FT. BGS

TOTAL VOLATILE ORGANIC COMPOUNDS

PROJECT : PRATT & WHITNEY
LOCATION : PALM BEACH , CO. , FLORIDA

DAMES & MOORE
PLATE 15

12038010261S/831

PRT 001

TABLE 1

WELL No.	SCREENED INTERVAL*	SOIL TYPE	WELL * DEPTH	PERMEABILITY** (FT/DAY)
LF-1a	10-15 ft	SP — SAND; LIGHT BROWN FINE TO MED. GRAINED WITH SILT	15 ft	1.6×10^{2}
LF-1b	29-49 ft	SP/SM — SAND; GRAY TO BROWN FINE TO MED. GRAINED WITH SILT	49 ft	6.5×10^{0}
LF-1c	55-65 ft	SP/SM — SAND; GRAY TO BROWN, SILTY MOSTLY FINE GRAINED	65 ft	5.7×10^{1}
LF-2a	15-20 ft	SP/SM — SAND; BROWN FINE TO MEDIUM GRAINED WITH SILT	20 ft	5.6×10^{1}
LF-2b	23-30 ft	SS — SANDSTONE; GRAY WITH FINE SAND AND SILT INFILLING	30 ft	4.0×10^{1}
LF-3a	12-17 ft	SP/SM — SAND; LIGHT BROWN FINE TO MEDIUM GRAINED WITH SILT	17 ft	7.0×10^{1}
LF-3b	35-50 ft	SP/SM — SAND; GRAY TO BROWN FINE TO MED. GRAINED WITH SILT	50 ft	7.1×10^{0}
LF-4a	20-40 ft	SP/SM — SAND; GRAY TO BROWN FINE TO MED. GRAINED WITH SILT	40 ft	7.9×10^{0}
LF-4b	63-70 ft	SM — SILTY SAND; LIGHT GREEN MOSTLY FINE GRAINED WITH SILT AND SHELL	70 ft	1.7×10^{0}
LF-5a	10-20 ft	SP/SM — SAND; BROWN FINE TO MEDIUM GRAINED WITH SILT AND CLAY	20 ft	1.8×10^{1}
LF-5b	20-50 ft	SP/SS — SAND; GRAY-BROWN FINE GRAINED WITH SILT AND SANDSTONE LENSES	50 ft	1.2×10^{1}
LF-6a	10-20 ft	SP/SM — SAND; LIGHT BROWN, FINE TO MEDIUM GRAINED WITH SILT AND CLAY	20 ft	2.5×10^{1}
LF-6b	20-45 ft	SP/SM — SAND; BROWN FINE TO MEDIUM GRAINED WITH SILT, SHELL AND SANDSTONE	45 ft	1.6×10^{1}
LF-7a	10-20 ft	SP/SM — SAND; BROWN, FINE GRAINED WITH SILT AND SOME CLAY	20 ft	2.2×10^{1}
LF-7b	20-40 ft	SP/SM — SAND; BROWN VERY FINE GRAINED WITH SILT AND TRACE CLAY	40 ft	5.4×10^{0}
LF-8a	10-15 ft	SP — SAND; LIGHT BROWN FINE TO MEDIUM GRAINED WITH TRACE SILT AND CLAY	15 ft	5.7×10^{1}
LF-8b	28-33 ft	SP/SM — SAND; BROWN MOSTLY FINE GRAINED WITH SILT AND SOME CLAY	33 ft	1.1×10^{1}
LF-8c	43-48 ft	SS — SANDSTONE; GRAY FRIABLE WITH SOME SILT INFILLING	48 ft	1.7×10^{1}
LF-9a	10-15 ft	SM — SAND; LIGHT BROWN FINE GRAINED WITH SILT AND CLAY	15 ft	1.6×10^{0}
LF-9b	30-35 ft	SP — SAND; LIGHT GRAY FINE GRAINED WITH TRACE SILT	35 ft	9.8×10^{0}
LF-9c	46-51 ft	SP — SAND; GRAY, FINE GRAINED WITH SILT AND ORGANIC CLAY	51 ft	2.4×10^{1}
LF-10a	10-15 ft	SP — SAND; LIGHT BROWN FINE TO MEDIUM GRAINED WITH SOME SILT AND CLAY	15 ft	9.8×10^{1}
LF-10b	27-32 ft	SP — SAND; GRAY-BROWN FINE GRAINED WITH SOME SILT	32 ft	1.5×10^{1}
LF-10c	42-47 ft	SS/OL — SANDSTONE; GRAY FRIABLE WITH SHELL, ORGANIC CLAY AT BASE	47 ft	1.3×10^{1}

* BELOW GROUND SURFACE
** HORIZONTAL PERMEABILITY CALCULATED FROM PUMPING AND FALLING HEAD TESTS

DAMES & MOORE
TABLE

APPROVED ____ DATE ____
DRAWN ____ DATE ____
BY ____
1203801026 12/831

PRT 001

TABLE 1

WELL No.	SCREENED INTERVAL*	SOIL TYPE		WELL DEPTH *	PERMEABILITY** (FT/DAY)
LF-11a	10-15 ft	SP	SAND; LIGHT GRAY FINE TO MEDIUM GRAINED WITH TRACE SILT AND CLAY	15 ft	1.5×10^{1}
LF-11b	25-30 ft	SS	SANDSTONE; GRAY SHELLY FRIABLE WITH TRACE CLAY	30 ft	1.9×10^{1}
LF-11c	40-45 ft	SS	SANDSTONE; GRAY SHELLY, FRIABLE WITH SILT AND CLAY	45 ft	8.8×10^{0}
LF-12a	10-15 ft	SP/SM	SAND; LIGHT BROWN FINE TO MEDIUM GRAINED WITH SILT AND TRACE CLAY	15 ft	1.2×10^{1}
LF-12b	25-30 ft	SM	SILTY SAND; LIGHT BROWN FINE GRAINED WITH TRACE CLAY	30 ft	5.3×10^{0}
LF-12c	43-48 ft	SP/SS	SAND; LIGHT GRAY MOSTLY FINE GRAINED WITH SILT AND SANDSTONE	48 ft	8.8×10^{0}
PP-4a	5-27 ft	SP/SM	SAND; GREEN-BROWN FINE TO MEDIUM GRAINED WITH SILT	27 ft	1.3×10^{1}
PP-4b	27-47 ft	SS/SP	SANDSTONE; GRAY-BROWN FRIABLE WITH SAND LENSES	47 ft	8.7×10^{0}
PP-7a	12-27 ft	SP/SM	SAND; GRAY-BROWN FINE GRAINED WITH SILT AND CLAY	27 ft	1.3×10^{1}
PP-7b	27-52 ft	SS	SANDSTONE; GRAY SHELLY WITH SILT AND CLAY INFILLING	52 ft	4.7×10^{1}

* BELOW GROUND SURFACE

** HORIZONTAL PERMEABILITY CALCULATED FROM PUMPING AND FALLING HEAD TESTS

PRT 001

TABLE II

WATER QUALITY PARAMETERS TESTED

MAJOR IONS AND SELECTED PARAMETERS

Calcium	Chloride	Turbidity	pH
Sodium	Sulfate	Total Dissolved Solids	Alkalinity
Potassium	Phosphate	Specific Conductance	Oil and Grease
Ammonia	Nitrate	Color	Cyanide
Ammonium	COD	Gross Alpha	Gross Beta
Magnesium	Fluoride	TOC	
Carbonate Alkalinity		Bicarbonate Alkalinity	

METALS

Arsenic	Iron	Selenium
Barium	Lead	Vanadium
Cadmium	Nickel	Silver
Copper	Mercury	Zinc
Chromium	Manganese	

PESTICIDES

Aldrin	4,4 DDT	Heptachlor Epoxide
α BHC	4,4 DDE	PCBs
β BHC	4,4 DDD	Toxaphene
γ BHC	Dieldrin	
δ BHC	α endosulfan	
Chlorodane	β endsosufan	
Endrin	endosulfan sulfate	
Endrin Aldahyde	Heptachlor	

OTHER TOXIC POLLUTANTS

Total Volatile Organic Compounds (See Table 4 for breakdown)
2, 4-D
2, 4, 5-T
2, 4, 5-TP

Table III a

MAJOR IONS AND SELECTED PARAMETERS

Parameter / Well	Ca	Mg	Na	K	Cl	SO_4	HCO_3	NO_3	COD	TOC	pH	Color (Color Units)	F	TDS	PO_4	NH_4	NH_3	Specific Conductance (umhos)	Total Alkalinity	Oil & Grease	Turbidit (TU)	anide
C								<0.05	25		6.4	100+		413	0.55	<0.02	5.5	550	86	< 1.0	32	< 0.05
D								"	400		6.4	100+		1500	0.60	"	1.4	2000+	576	< 1.0	18	"
LF-8a	160	16	160	0.79	300	1.0	618	"	75	245	6.3	70	0.43	1280	0.08	"	5.4	1710	618	< 1.0	29	"
LF-8b	100	3	65	0.13	99	4.3	226	"	30	85	6.4	100+	0.76	472	0.24	"	0.6	630	226	"	43	"
LF-8c	92	6	50	0.14	90	2.1	254	"	85	88	6.9	100+	0.59	458	0.03	"	0.4	610	254	"	21	"
LF-9a	280	32	110	2.65	535	0.1	248	"	170	333	6.1	100+	0.38	1500	0.03	"	17.2	2000+	248	"	33	"
LF-9b	460	62	100	1.60	915	21.0	142	"	365	415	5.4	48	0.47	1500	0.06	0.19	15.2	2000+	142	"	11	"
LF-9c	250	12	85	0.27	346	1.0	316	"	120	115	6.5	94	0.62	485	0.05	0.25	0.5	1310	316	"	21	"
LF-10a	155	11	20	0.33	90	1.0	250	"	50	132	6.2	100+	1.30	472	0.17	0.02	0.5	630	25	"	48	"
LF-10b	90	14	75	0.20	199	1.0	194	"	130	117	5.7	94	1.05	638	0.26	"	0.4	850	194	"	20	"
LF-10c	158	5	40	0.12	127	1.3	266	"	70	105	6.5	32	0.93	563	0.49	"	0.1	750	266	"	7.3	"
LF-11a	78	1.6	65	0.15	118	12.8	130	"	35	33	7.0	54	0.59	413	0.34	0.24	2.1	550	130	"	9.6	"
LF-11b	78	3	60	0.30	110	4.0	210	"	15	35	6.9	45	0.59	472	0.23	0.02	9.7	630	210	"	9.7	"
LF-11c	102	4	65	0.17	97	1.3	232	"	25	70	6.9	61	0.45	480	0.56	0.17	12.1	640	232	"	15	"
LF-12a	128	5	40	0.05	32	1.0	302	"	45	97	6.4	100+	0.20	480	0.05	0.22	0.4	550	302	"	10.5	"
LF-12b	79	4	20	0.09	33	2.8	5.2	"	50	45	6.6	100+	1.11	278	1.72	0.02	0.1	370	248	"	76	"
LF-12c	102	1	30	0.10	33	240	2.6	"	35	47	6.8	100+	0.87	360	0.21	"	0.1	480	240	"	32	"
PW-17	100	6	30	0.09	51	1.0	262	"	45		6.5	52	0.45	413	7.1	0.31	0.7	550	262	"	4.8	"
State Standards Class G-II Waters					250	250		10.0			6.5	15	1.4-2.4	500							5	

Concentrations in mg/l unless noted otherwise
Sampling Date 3/24/82

PRT 001

TABLE IIIb
METAL CONCENTRATIONS

Well	As	Ba	Cd	K	Vd	Total Cr	Cu	Fe	Pb	Mn	Hg	Ni	Se	Ag	Zn	Tot Metal Con	ration
PW-17	<0.06	0.1	<0.01	0.085	<0.02	0.01	0.01	<0.05	<0.05	<0.02	<0.0002	<0.01	<0.01	<0.005	0.55	1.00	
LF-8a	<0.06	0.2	<0.01	0.79	<0.02	0.01	0.01	<0.05	<0.05	0.07	<0.0002	0.02	<0.01	<0.005	0.20	1.51	
LF-8b	<0.06	0.05	<0.01	0.13	<0.02	0.01	0.01	0.10	<0.05	0.03	<0.0002	<0.01	<0.01	<0.005	<0.05	0.55	
LF-8c	<0.06	<0.05	<0.01	0.14	<0.02	0.01	<0.01	<0.05	<0.05	0.04	<0.0002	<0.01	<0.01	<0.005	<0.05	0.57	
LF-9a	<0.06	0.55	<0.01	2.65	<0.02	0.01	0.01	28.6	0.06	1.18	<0.0002	0.065	<0.01	<0.005	0.20	33.43	
LF-9b	<0.06	0.20	<0.01	1.10	<0.02	0.01	0.02	29.1	0.06	0.40	<0.0002	<0.01	<0.01	0.005	0.05	31.06	
LF-9c	<0.06	0.05	<0.01	0.27	<0.02	0.01	0.01	0.05	<0.05	0.12	<0.0002	<0.01	<0.01	<0.005	0.05	0.78	
LF-10a	<0.06	0.05	<0.01	0.33	<0.02	<0.01	0.01	0.20	<0.05	0.13	<0.0002	<0.01	<0.01	<0.005	<0.05	0.95	
LF-10b	<0.06	0.05	<0.01	0.20	<0.02	<0.01	0.01	1.2	<0.05	0.04	<0.0002	<0.01	<0.01	<0.005	<0.05	1.73	
LF-10c	<0.06	<0.05	<0.01	0.12	<0.02	0.01	<0.01	<0.05	<0.05	0.04	<0.0002	<0.01	<0.01	<0.005	<0.05	0.51	
LF-11a	<0.06	0.05	<0.01	0.15	<0.02	<0.01	<0.01	0.20	<0.05	<0.02	<0.0002	0.03	<0.01	<0.005	<0.05	0.67	
LF-11b	<0.06	0.05	<0.01	0.30	<0.02	0.01	0.02	<0.05	<0.05	<0.02	<0.0002	0.02	<0.01	<0.005	<0.05	0.68	
LF-11c	<0.06	<0.05	<0.01	0.17	<0.02	0.01	0.01	0.20	<0.05	<0.02	<0.0002	0.02	<0.01	<0.005	0.05	2.68	
LF-12a	<0.06	0.05	<0.01	0.05	<0.02	<0.01	0.02	2.60	<0.05	0.04	<0.0002	<0.01	<0.01	<0.005	0.05	2.99	
LF-12b	<0.06	0.05	<0.01	0.09	<0.02	0.02	0.01	0.10	<0.05	0.02	<0.0002	<0.01	<0.01	<0.005	<0.05	0.51	
LF-12c	<0.06	<0.05	<0.01	0.10	<0.02	<0.01	0.01	0.10	<0.05	0.03	<0.0002	<0.01	<0.01	<0.005	0.05	0.52	
State Standards Class G-II Waters	0.05	1.0	0.01			0.05	1.0	0.3	0.05	0.05	.002		0.01	0.05	5.0		

Note: Concentrations in Milligram/Liter
Sampling Date 3/24/82

TABLE IV
VOLATILE ORGANICS - micrograms/liter (μg/l)

COMPOUND	1A	1B	1C	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B	7A	7B
BIS (CHLOROMETHYL) ETHER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLORODIBROMOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROETHANE	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-CHLOROETHYVINYL ETHER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	0.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	1.0
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.4	2.1	6.3	6.0	2.8	1.8
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROPROPENE	NR	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	NR	ND	ND	ND	ND	ND	ND	NR	NR	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	1.8	2.7	2.2	1.5	1.5	1.8	4.8	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	0.2	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	0.2	ND	ND	ND	ND	ND	ND	ND
trans-1,2-DICHLOROETHYLENE	0.7	ND	ND	ND	ND	ND	ND	10.0	3.1	6.7	5.8	6.0	6.4	9.0	7.0
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	4.7	2.0	6.5	4.6	4.3	6.2	2.5	ND
TRICHLOROFLUOROMETHANE	ND	ND	ND	0.3	0.3	0.1	0.2	ND	ND	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	0.5	ND	0.5	ND	ND	ND	ND	0.1	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLOROIODOMETHANE	NR	NR	NR	NR	NR	NR	NR	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROBUTANE	NR	NR	NR	NR	NR	NR	NR	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	ND	ND	ND	NR	NR	ND	ND	ND	ND	ND	ND
TOULENE	ND	ND	ND	ND	ND	ND	ND	NR	NR	ND	ND	ND	ND	ND	ND
cis-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL	5.2	2.7	2.2	1.8	1.8	1.9	5.0	15.2	5.1	17.6	12.5	16.6	15.6	15.5	9.8

*NOTE: STATE STANDARDS NOT YET PROMULGATED ND-None detected, NR-Not Run

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TABLE IV (Cont'd)

COMPOUND	8A	8B	8C	9A	9B	9C	10A	10B	10C	11A	11B	11C	12A	12B	12C
BIS (CHLOROMETHYL) ETHER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	)
BROMOFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	)
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	)
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	)
CHLORODIBROMOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	)
CHLOROETHANE	ND	ND	ND	2,856	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	)
2-CHLOROETHYVINYL ETHER	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	)
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.5	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	930	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROPROPENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROETHENE	7.8	4.9	15.3	178	13,022	23,199	4,794	243	85	12.8	19.5	5.3	ND	19.2	5.9
trans-1,2-DICHLOROETHYLENE	6.2	8.9	5.3	2,475	261,720	56,196	5,348	152	195	4.2	6.9	5.1	8.2	ND	4.7
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	3.7	2.7	1.7	360	277,300	432,380	1,515	33	39	16.9	18.2	24.8	95.6	84	22.9
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	60	2,400	35,600	9,200	2,200	7,400	6,300	ND	ND	ND	150	8	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLOROIODOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROBUTANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOULENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL	17.7	16.5	82.3	9,199	587,642	520,975	13,857	7,828	6,619	34	44.6	35.2	258.3	111.2	33.5

TABLE IV (Cont'd)

COMPOUND	WELL A	WELL B	WELL C	WELL D	PP 7A	PP 7B	SW POND	NW POND	PW 17
BIS (CHLOROMETHYL) ETHER	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLORODIBROMOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	2.5	ND	ND	ND	ND	1.8	ND
2-CHLOROETHYVINYL ETHER	ND	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	ND	ND	ND	ND	ND	ND	6.4	4.6	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLORODIFLUOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	2.2	230	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHENE	1.0	ND	1.2	ND	ND	ND	ND	ND	ND
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROPROPENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
METHYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROETHENE	ND	ND	ND	ND	11.5	7.8	16.2	7.2	12.8
trans-1,2-DICHLOROETHYLENE	6.7	ND	7.1	161,434	6.3	6.5	30.9	52.0	7.1
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	2.4	72,291	26.1	20.1	4.4	ND	5.2
TRICHLOROFLUOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	50,000	ND	ND	2.0	10.0	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
DICHLOROIODOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROBUTANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOULENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-DICHLOROETHYLENE	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL	7.7	0	15.4	283,955	43.9	34.4	59.9	75.6	25.1

PRT 001

PRT 001

APPENDIX A

PRT 001

APPENDIX A

MONITOR WELL INSTALLATION

A total of twelve monitoring well clusters were installed in the PWA landfill area. The locations of each cluster are shown on Plate 3.

The primary purpose of the monitoring wells is to provide water quality data necessary to delineate the extent of ground water contamination in the landfill area. The wells are also used to obtain water level measurements for determining the direction of ground water flow, and to perform in-situ testing to quantify aquifer permeabilities.

All monitoring wells with the exception of wells A, B, C, and D at Pratt & Whitney's landfill were drilled by Buddy Systems, Incorporated of Lakeland, Florida, utilizing a Failing 1500 or tractor-mounted rotary wash drilling rig. A Dames & Moore hydrogeologist supervised all aspects of the monitoring well installation. Wells A, B, C, and D are two-inch wells installed in the late 1970's.

Monitoring wells were constructed of four-inch diameter, Schedule 40 PVC solid casing and a variable length of Schedule 40 slotted PVC casing. Slot sizes varied from 0.010 to 0.015 inch. A schematic depicting the typical cluster construction is presented on Plate 4.

Generally, three monitoring wells were installed in each cluster. The number of wells, depth and screened interval of each monitor well was dependent upon changes in sediment type as determined from the soil boring. Thus, each monitoring well within the cluster was designed to yield hydrologic and water quality data within a specific horizon at that location. Table 1 identifies the total depth and screened interval of each monitoring well.

To facilitate the installation of each monitoring well cluster, the four-inch diameter soil boring was converted into the deep monitoring well. This was accomplished by reaming the four inch boring to eight inches prior to

installing the PVC casing. The other wells in each cluster were installed in a similar manner without soil testing.

To insure proper well development and the satisfactory removal of all cuttings during drilling, a biologically degrading drilling mud was used. The advantage of using this type of mud was that it degrades after 72 hours, thus facilitating adequate well development prior to taking water samples. After the hole was drilled to the desired depth and flushed for several minutes to remove cuttings, the PVC casing was lowered to the bottom of the hole. The annulus between the four-inch PVC casing and the eight-inch diameter hole was packed with Number 620 gravel to approximately two feet above the screened interval. Bentonite clay pellets were then placed on top of the gravel to insure that the water quality measurements would not be influenced by leakage from above. Cement-bentonite slurry was then set from the top of the bentonite clay layer to the top of the hole in order to seal the remainder of the well annulus. This well construction technique was strictly adhered to for all monitoring wells installed.

Well development was accomplished by swabbing the well utilizing a tool consisting of a five-foot long steel rod to which two four-inch diameter rubber discs, spaced approximately four feet apart, are attached. The tool was continually lowered to the bottom of the well and then rapidly pulled upward creating a suction. This drew the finer soil particles from within the gravel pack into the well, and subsequently to the surface. After the monitoring well was satisfactorily swabbed, a two-inch diameter PVC pipe was lowered to the bottom of the well, and the well was pumped for approximately one hour to remove all the remaining fine grained material.

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MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

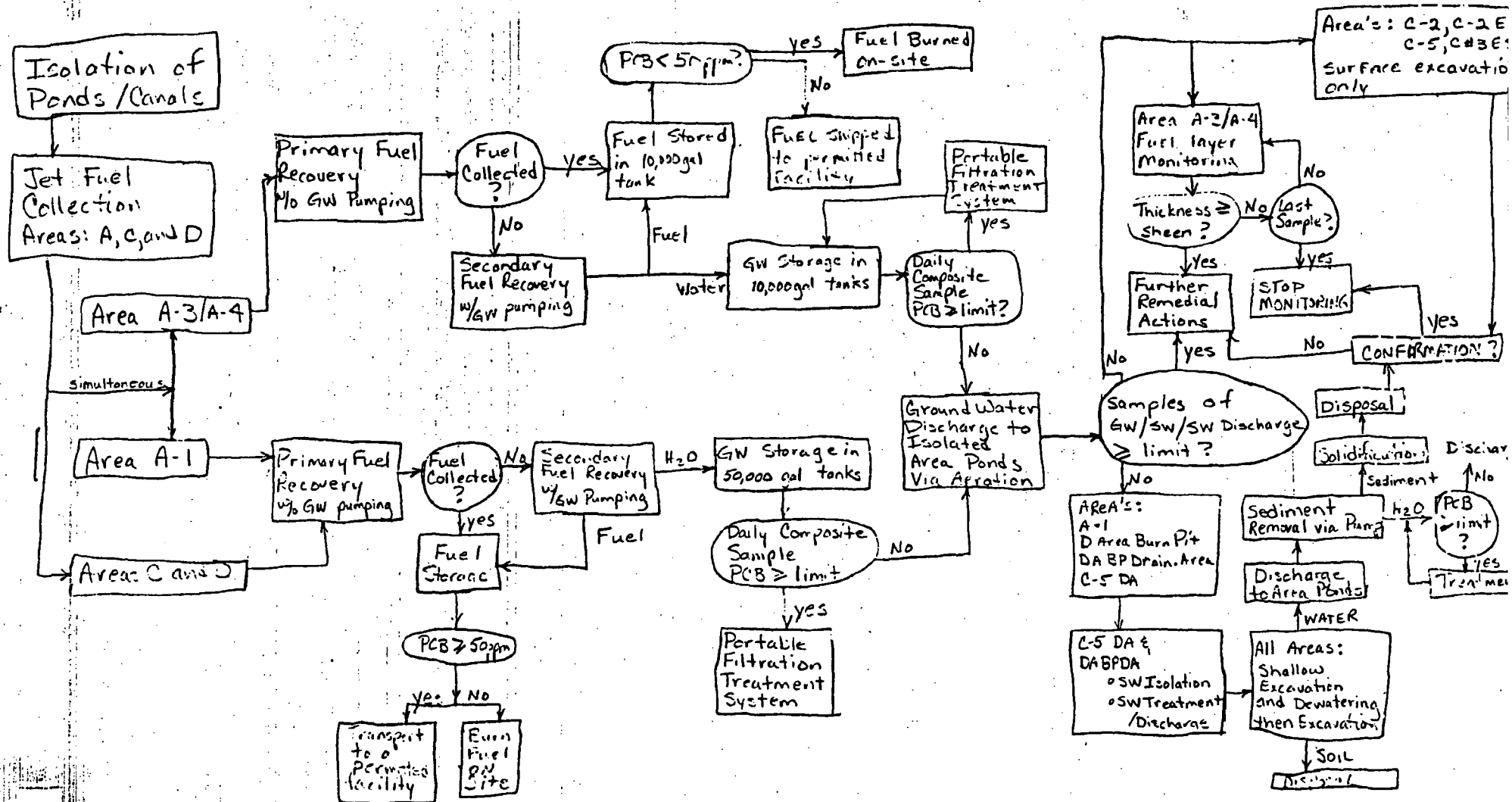
NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

FORM NO. 467.3 (4-78)

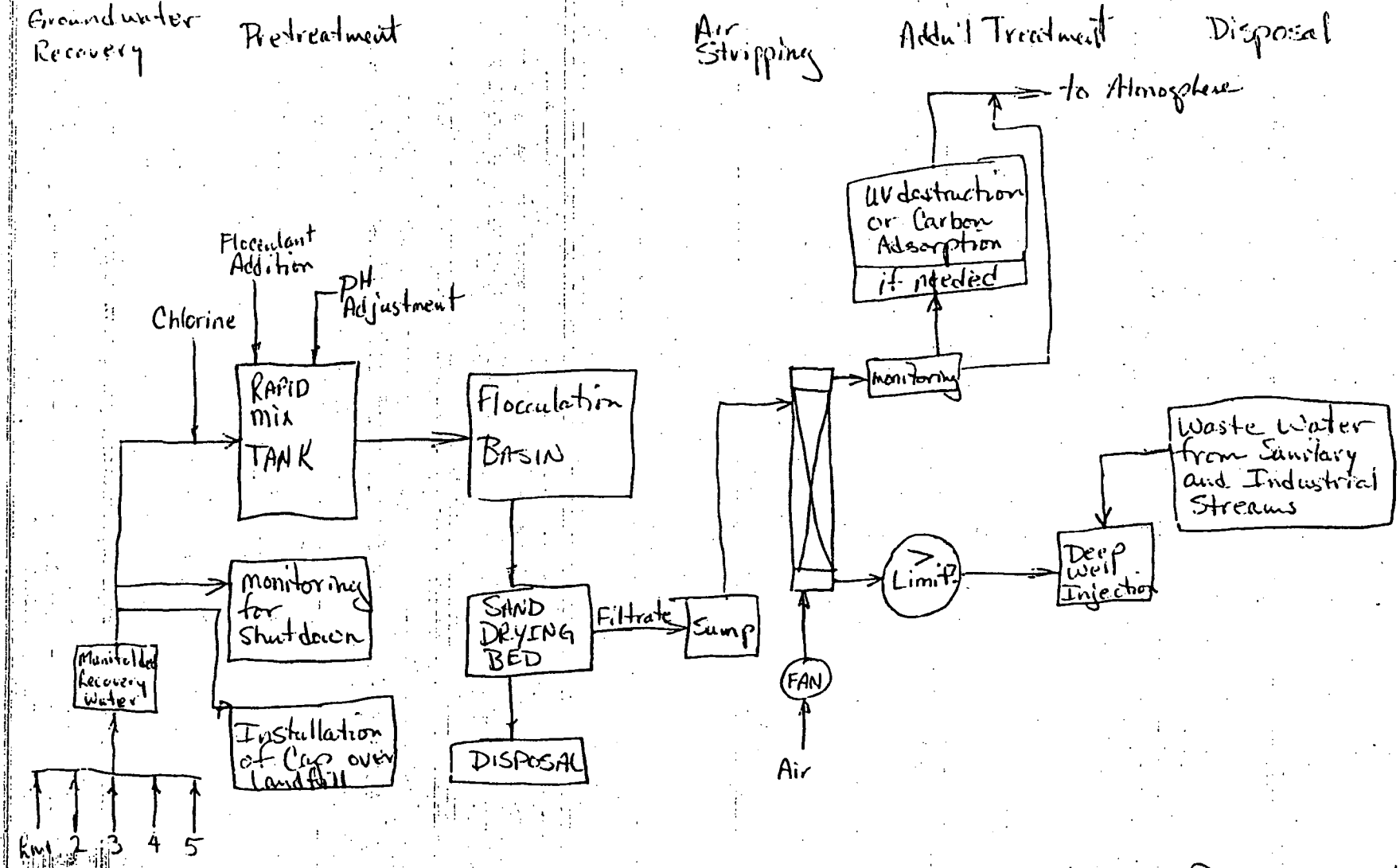
DAMES & MOORE

PLATE



PWA - PCB R.A.P. 11/16/84 BFC

PRT 001



PWA Landfill Remedial Action Plan 11/16/84 BKC

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 17 1984

Honorable Tom F. Lewis
House of Representatives
1313 Longworth House Office Building
Washington, D.C. 20515

Dear Honorable Lewis:

During our meeting on September 25, concerning the status of the Pratt and Whitney site in West Palm Beach, Florida, you requested a copy of the letter that was sent from Lee Thomas, Assistant Administrator for the Office of Solid Waste and Emergency Response, to Congressman Florio regarding the same site. Enclosed please find a copy of the letter.

You also requested a status report on EPA's involvement at the Florida Steel site in Indiantown, Florida. The Florida Steel site is a State enforcement lead site. The Florida Department of Environmental Regulation (FDER) and the company have asked our Region IV Office in Atlanta to review proposed workplans addressing the cleanup of the Emission Control (EC) dust and PCBs.

Our Region IV Office has received and reviewed the company's "PCB Remedial Action Plan". Comments on the plan were sent to FDER in late September. The "EC Dust Remediation Plan" has not been forwarded to the regional office. It is expected sometime this month.

Our Region IV Office is working closely with FDER to ensure that the State's proposed consent agreement with Florida Steel is technically sound and is in conformance with the requirements of the National Contingency Plan. This coordination will facilitate the possible future delisting of the site from the National Priorities List.

Should you or your staff have any questions concerning either Pratt and Whitney or Florida Steel please contact me at 382-4832 or Al Hanke, in Region IV, at (404) 881-2643.

Sincerely,

Lawrence A. Weiner

Lawrence A. Weiner
Environmental Scientist

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 11 1984

Chairman James J. Florio
Subcommittee on Commerce
Transportation and Tourism
Committee on Energy and Commerce
House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

This is in response to your letter of August 17, 1984 concerning the Pratt and Whitney site in Palm Beach County, Florida.

You raised a concern that the cleanup, negotiated between Pratt and Whitney and the State of Florida, "could be delayed if EPA requires additional, and possibly duplicative" studies. Please be assured that EPA has no desire to delay the cleanup nor require Pratt and Whitney to perform duplicative studies.

The State of Florida, which has the enforcement lead in this case, has requested that our Region IV Office in Atlanta review the technical and engineering studies performed by Pratt and Whitney's technical consultant. The purpose of the review is to provide comments to the State regarding the consistency of the work with the National Contingency Plan (NCP). Region IV has convened the Regional Response Team (RRT) to assist in this effort and the review process is underway. A meeting to discuss the RRT's comments is scheduled for September 11, in West Palm Beach, Florida at the District Office of the Florida Department of Environmental Regulation.

Because the Pratt and Whitney site is not currently on the National Priorities List (NPL) the State is not bound by our comments. Should the site be included on the NPL and should we find Pratt and Whitney's work to be deficient then we would require that additional work be performed in order to ensure consistency with the NCP. I am sure you understand the importance of EPA's role and responsibility in ensuring that any investigative and remedial work performed at NPL sites, whether by EPA or potentially responsible parties, be consistent with the NCP.

Should you or any of your staff have further questions please do not hesitate to contact me.

Sincerely yours,

Lee M. Thomas
Assistant Administrator

PRT 001 CONTROL SLIP FOR OFFICE OF CONGRESSIONAL CORRESPONDENCE
RM. 227-G, WSMW
382-7640

CONTROL NO: AL402998

DUE DATE: 09/07/84

DUE TO LEE THOMAS
BY: 9/5/84

FROM: CHAIRMAN JAMES J. FLORIO D/NJ/01
SUBCOMMITTEE ON ENERGY CONSERVATION AND POWER
COMMITTEE ON ENERGY AND COMMERCE
HOUSE OF REPRESENTATIVES
WASHINGTON , DC 20515

INCOMING: 08/17/84

RECEIVED: 08/22/84

ASSIGNED: 08/23/84

CLOSED: _____

CONSTITUENT: , 00000

SUBJECT: CLEAN-UP SITE/PALM BEACH COUNTY, FLORIDA

ASSIGNED: 1 SOLID WASTE & EMERG RESP 3 _____
OWPE 8/24
2 ~~OECR 8/23~~ 4 _____
CC: Lee Thomas
Linda Fisher

SIGNATURE: ASSISTANT ADMINISTRATOR

SPECIAL INSTRUCTIONS:

MUST BE RETURNED TO RM. 227-G WSMW, FOR REVIEW AND DISPATCHING. INCLUDE COPY OF REPLY FOR CONGRESSIONAL FILES.

NOTE: 1. REPLY: DEAR MR. CHAIRMAN:

COURTESY COPIES:

REGION 04
REGIONAL OPERATIONS
A-103/MS. CROFT

PRT 001

NINETY-EIGHTH CONGRESS

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U.S. House of Representatives

Committee on Energy and Commerce

SUBCOMMITTEE ON COMMERCE, TRANSPORTATION, AND TOURISM

ROOM M2-181
HOUSE OFFICE BUILDING ANNEX NO. 2
PHONE (202) 226-3160

GREGORY E. LAWLER
CHIEF COUNSEL AND STAFF DIRECTOR

Washington, D.C. 20515

August 17, 1984

SW
R4
20
Cole
FF

The Honorable Lee Thomas
Assistant Administrator
Office of Solid Waste and Emergency Response
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20560

Dear Mr. Thomas:

I am writing to bring to your attention a concern that has been raised that the clean-up of a hazardous waste site in Palm Beach County, Florida could be delayed if EPA requires an additional, and possibly duplicative, feasibility study. It is my understanding that the United Technologies Corporation has successfully concluded negotiations with the Florida Department of Environmental Regulation concerning remedial action at the site and is willing to commence clean-up operations. The company is concerned that EPA may require an additional feasibility study which could have the effect of delaying remedial action and lead to additional groundwater contamination.

I would appreciate your views on whether a new feasibility study is necessary and whether such a study would delay clean-up of the site.

Thank you for your attention to this matter.

Sincerely,

James J. Florio, Chairman
Subcommittee on
Commerce, Transportation and Tourism

JJF:chd

8/22/84

OCT 18 1984

REF: 4AH-ER

Roy Duke, District Manager
Southeast Florida District
Florida Department of
Environmental Regulation
P.O. Box 3858
3301 Gun Club Road
West Palm Beach, FL 33402

Re: Proposed Addenda to PCB & Landfill Remedial Action Plans for the Pratt & Whitney Aircraft NPL CERCLA Site, West Palm Beach, FL

Dear Mr. Duke:

Enclosed is a copy of the EPA revised addendum for the above mentioned Remedial Action Plans. These changes and comments reflect the reviews of EPA IV's Groundwater Section and Remedial Action Section. The changes from the original language are underlined. The comments that follow individual addenda must be resolved to EPA and DER's satisfaction as they concern important environmental quality matters.

If you have any questions or comments concerning these revisions please contact me at (404)881-2643.

Sincerely,

A. R. Hanke, Chairman
Regional Response Team

cc: John Gentry, Tall. FDER
Zoe Kulakowski, Tall. FDER
Sam Johnston, Tall. FDER
Micheal Snyder, PBC HD
Gardener Strasser, DER (SE)
Gail Mitchell, WSB
Ann Ashell, ORC
Richard Reis, SEDER

PRT 001

UNITED TECHNOLOGIES
PRATT&WHITNEY
AIRCRAFT

P. O. Box 2691
West Palm Beach, Florida 33402
305/840-2000

Government Products Division

November 6, 1984

EMER. RESP.
RECEIVED
NOV 14 1984
EPA-REGION IV
ATLANTA, GA.

Mr. Al Hanke, Chairman
Regional Response Team
United States Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30365

Dear Mr. Hanke:

On October 25, 1984 we received a copy of your October 18, 1984 letter to the Florida Department of Environmental Regulation (DER) detailing the U. S. Environmental Protection Agency's (EPA) comments on the respective addendums to Pratt & Whitney's (P&W) polychlorinated biphenyl (PCB) and landfill ground water remedial action plans (RAP). We have incorporated your revised or additional wording into our respective RAP addendums, and the addendums, as revised, are attached. In the attached revisions we have also addressed your comments on items #5, #6, and #9 of the PCB RAP and the DER's comments on item #5 of the PCB RAP and item #3 of the landfill ground water RAP. We have further attached to this letter drawings indicating the proposed locations of the new monitoring wells requested by your comments on items #3 and #9 of the PCB RAP addendum, and your approval of these locations is requested. With this submittal P&W has addressed the remaining RRT open items as defined in your letter of October 18, 1984 and the DER's letter to P&W of October 22, 1984.

Pratt & Whitney (P&W) has been and continues to be committed to executing its remedial action plans. After receiving the concurrence of the Florida DER with our PCB Remedial Action Plan on July 5, 1984, we met with you on August 2, 1984, to follow up on previous conversations in which the EPA indicated that they felt there would be no problem in P&W commencing cleanup. That meeting created the Regional Response Team (RRT) with which we are currently involved. The RRT met on September 11, 1984, and as a result of that meeting P&W forwarded addendums to each of its RAP's to the RRT on September 18, 1984.

It is now November, and it appears that the regulatory review delays, which have consumed the past 4-5 months, have now eliminated any chance of completing fuel removal (which must precede soil removal) early enough in 1985 to complete PCB contaminated soil removal before the end of the 1985 "dry" season (Nov.'84-May'85). Since the DER has insisted upon soil removal during the "dry" season, the effect of these regulatory delays has been to postpone a significant portion of the PCB cleanup into the 1986 dry season and thus delay cleanup completion by one year.

2745/1

PRT 001

Pratt & Whitney has put forward a significant effort and resource commitment into planning sound and responsible remedial actions. The technical issues have been addressed. Our principal consultants, Roy F. Weston, Inc. and CH2M Hill, who formulated our remedial action plans, are the same consultants used by the EPA on various Superfund cleanup projects. It is P&W's opinion that further planning has reached the point of marginal returns. Thus P&W requests the prompt approval of our respective remedial action plans by the RRT so that we may go through our purchasing cycle, initiate the competitive bidding process, and commence cleanup.

Sincerely,

J. L. Seelinger

J. L. Seelinger, Manager
Utilities Operations/Environmental Affairs

JLS/fo/2745/2
Attachments

cc: M. O. Brown
R. M. Duke - DER
R. H. Henson
E. J. Sacco - PBCHD

PRT 001

ADDENDUM TO PCB REMEDIAL ACTION PLAN

This addendum is a result of and a response to the comments received during the Regional Response Team (RRT) meeting held at the offices of the Florida Department of Environmental Regulation (DER) on September 11, 1984. Where items in this addendum conflict with items in the polychlorinated biphenyl (PCB) remedial action plan (RAP) the items expressed in this addendum shall take precedence.

1. In response to comments concerning a background well, P&W has redesignated well TH-11 located as shown in the attached drawing as the background well. This well was installed in 1981 and is regionally upgradient from the remediation sites. Prior to installation of well TH-11 none of P&W's industrial activities had taken place in this area of the plant site. This well will be sampled for PCB's and for volatile organics (VOC's) to establish whether concentrations of these substances are present in groundwater. This well will only be used for the background monitoring well if EPA and DER agree that the sampling data verifies the well as representative of groundwater in the region.

2. EPA and DER have expressed a desire to receive split samples at some point during the remedial activities. P&W will accommodate this request and will collect samples for EPA and DER on request. P&W and the regulatory agencies will analyze these samples.

3. During the RRT meeting the EPA expressed a concern that more ground water samples locally down gradient from the PCB contaminated areas should be taken to better quantify the amount of PCB's in the ground water. P&W will install additional monitoring wells to accomplish this sampling. Upon approval by EPA and DER of the well locations, the monitoring wells will be installed over the next few weeks, and the newly installed wells will then be sampled. Diagrams depicting additional monitoring well locations along with the sample results will be forwarded to the RRT members for evaluation and approval.

4. A question was posed as to whether P&W's jet fuel is a "leaded" fuel. P&W has confirmed that its jet fuel does not contain lead.

5. In response to the EPA's letter of October 18, 1984 and the DER's letter of October 22, 1984, P&W will sample the groundwater wells in the fuel contaminated areas and the downgradient wells (to be installed pursuant to item #3 above) for hexachlorobenzene; 1, 2, 4-trichlorobenzene; and 2-chloronapthalene. The samples will be collected and analyzed after the wells described in item #3 above are installed. Sample results will be forwarded to the RRT.

PRT 001

ADDENDUM TO PCB REMEDIAL ACTION PLAN
(Continued)

6. A concern was expressed for the amount of time the ground water fuel collection system would remain in place after the initial conclusion of fuel collection activities. As agreed upon in the RRT meeting, in the areas the soil is being removed from the same area where jet fuel is being collected, the fuel collection will be terminated as described in the RAP to allow the soil removal to proceed. However associated with fuel collection termination in the test stand A3-A4 area, additional checks will be made after one week and then monthly for 3 months to confirm there are no increases in the fuel layer. At test stand C2 additional checks for a fuel layer increase will be made weekly for 2-4 weeks after fuel collection termination. In response to the EPA's comment in their October 18 letter, the area A1 and D area burn pit will not be checked for fuel layer thickness and areal extent increases associated with termination of fuel collection because the soil in these two areas will be excavated after termination of jet fuel collection. In response to the DER letter of October 22, see item #5.

7. The DER expressed a concern that if the dissolved constituents in the ground water exceed state standards after the termination of jet fuel, soil, and sediment remediation activities, the ground water clean up will not be considered complete. If ground water levels having VOC concentrations above state standards remain, P&W will resume the ground water portion of the fuel collection activities until such time as ground water concentrations are at the levels in the background well or they stabilize at levels mutually acceptable to P&W, the DER and the EPA. In response to the DER letter of October 22, see item #5.

8. P&W has agreed that the sampling of the receiving water body for VOC's and PCB's would be done relatively close (within approximately 20 yds) to the spray aeration system discharge.

9. In response to the concern that a new PCB sediment layer not be built up as a result of PCB-containing water discharges during fuel collection and soil removal, where practical P&W will change the order of remedial activities. That is, where practical, sediment removal activities will be conducted after dewatering activities for fuel collection and soil removal. Otherwise confirming sediment samples will be collected. In response to the EPA's comment regarding PCB migration in their October 18 letter, monitoring wells will be installed around the discharge areas. They will be sampled for PCB's every other week during discharging operations in the respective areas. Proposed monitoring well locations are attached to this addendum.

ADDENDUM TO PCB REMEDIAL ACTION PLAN
(Continued)

10. The DER sampling and analysis QA/QC program will be incorporated into the sampling and analysis activities of the remediation contractor for execution of the PCB remedial action plan.

PRT 001

ADDENDUM TO LANDFILL GROUND WATER REMEDIAL ACTION PLAN

This addendum is a result of and a response to the comments received during the Regional Response Team (RRT) meeting held at the office of the Florida Department of Environmental Regulation (DER) on September 11, 1984. Where items in this addendum conflict with items in the landfill ground water remedial action plan (RAP) the items expressed in this addendum shall take precedence.

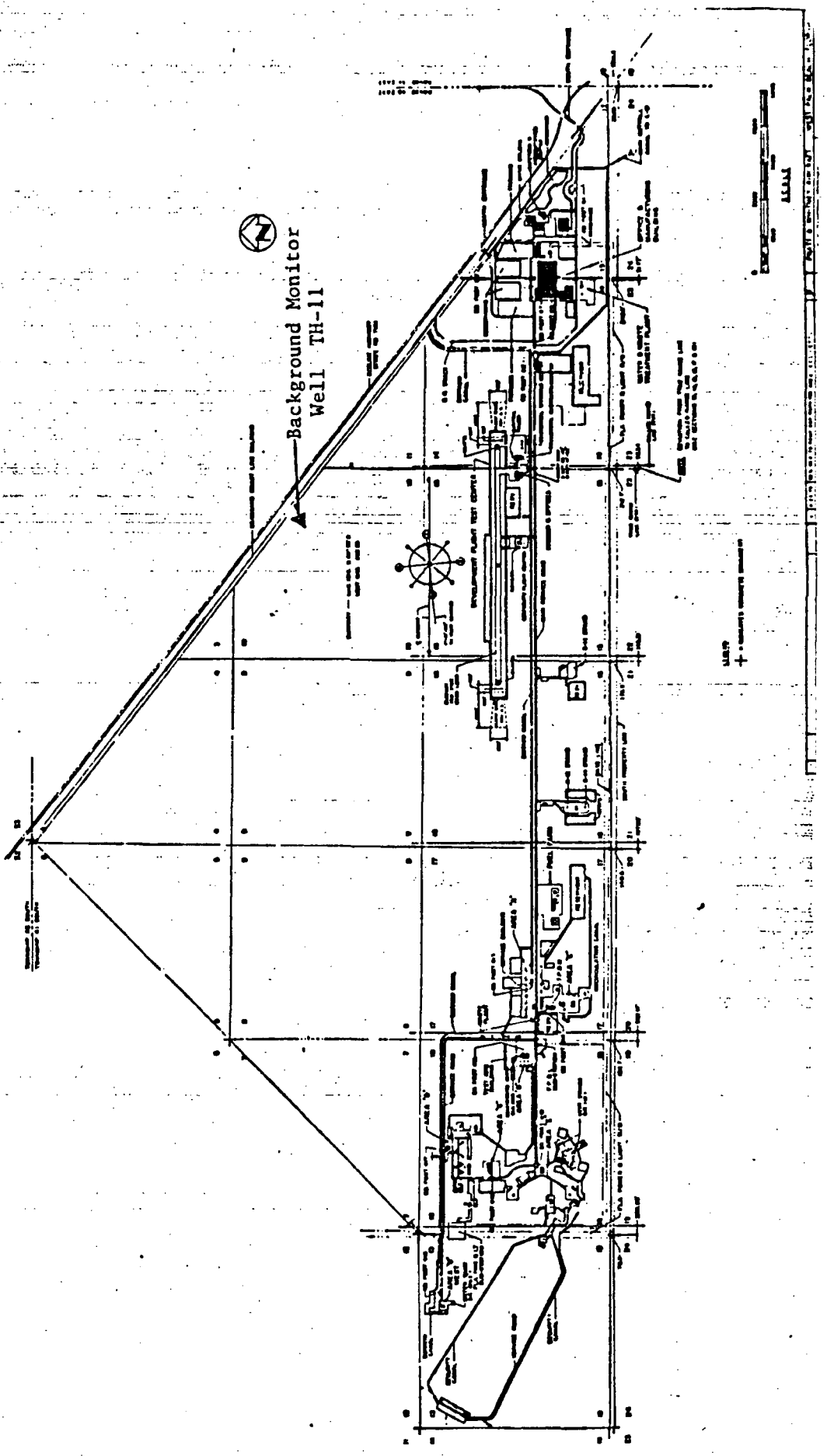
1. In response to comments concerning a background well, P&W has redesignated well TH-11 located as shown in the attached drawing as the background well. This well was installed in 1981 and is regionally upgradient from the remediation sites. Prior to installation of well TH-11 none of P&W's industrial activities had taken place in this area of the plant site. This well will be sampled for volatile organics (VOC's) to establish whether concentrations of these substances are present in groundwater. This well will only be used for the background monitoring well if EPA and DER agree that the sampling data verifies that the well is representative of groundwater in the region.

2. EPA and DER have expressed a desire to receive split samples at some point during the remedial activities. P&W will accommodate this request and will collect samples for EPA and DER on request. P&W and the regulatory agencies will analyze these samples.

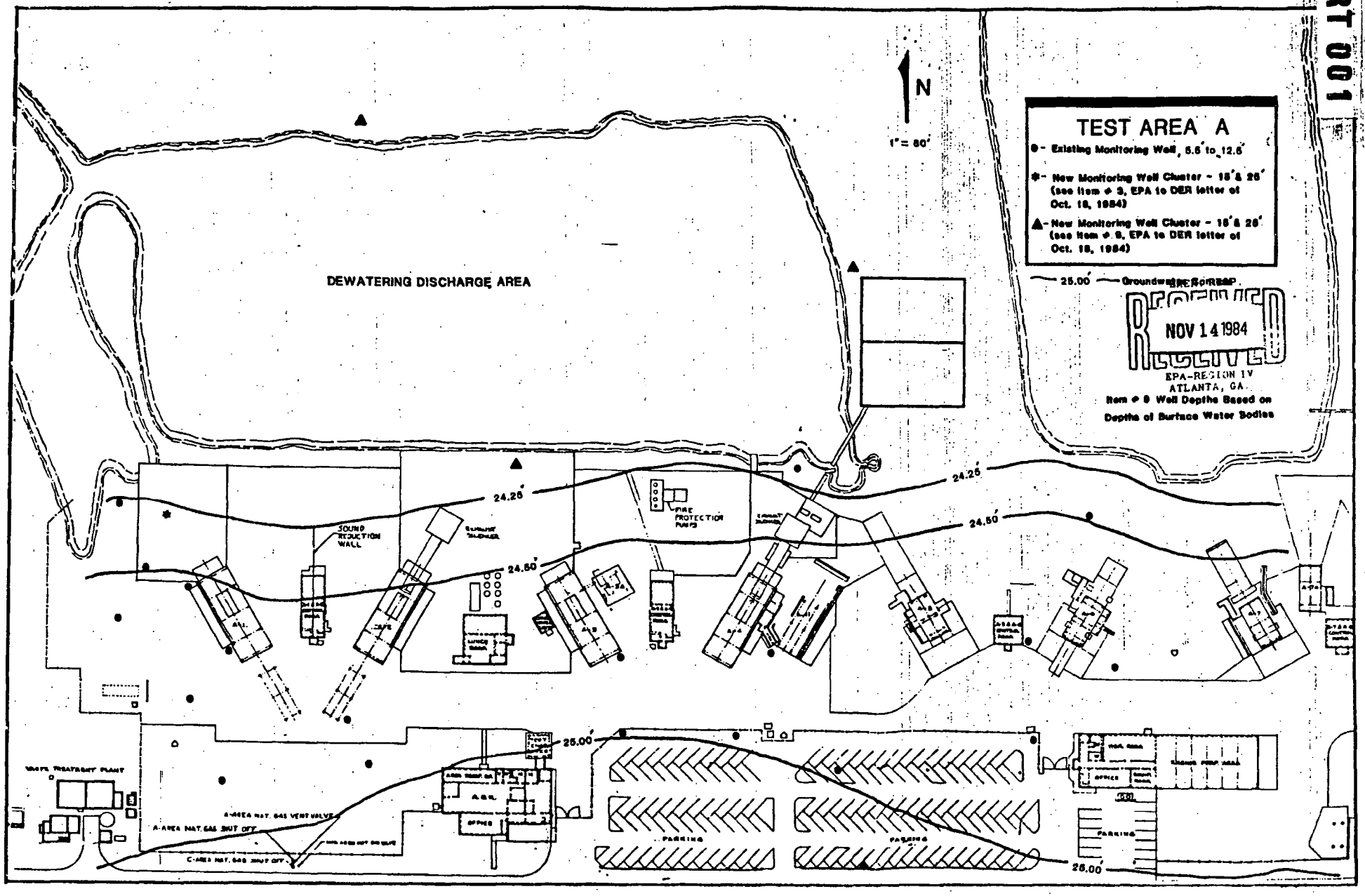
3. During operation of the landfill hydraulic barrier system, water level readings will be periodically taken at appropriate landfill monitoring wells to measure drawdown. The discharge rate of the recovery system may be adjusted based on these water level data to assure an effective hydraulic barrier system. After shutdown of the barrier system and after stabilization of groundwater levels, water level data will be collected from the landfill monitoring wells to establish the groundwater flow pattern. Based on this information, wells to monitor the effectiveness of the groundwater recovery program will be selected. The location of these wells will be approved by EPA/DER and the wells will be monitored quarterly for 10 years for water levels and VOC's. Should this monitoring indicate the release and/or continued migration of VOC's, resumption of the recovery operation or other appropriate remedial action may be required.

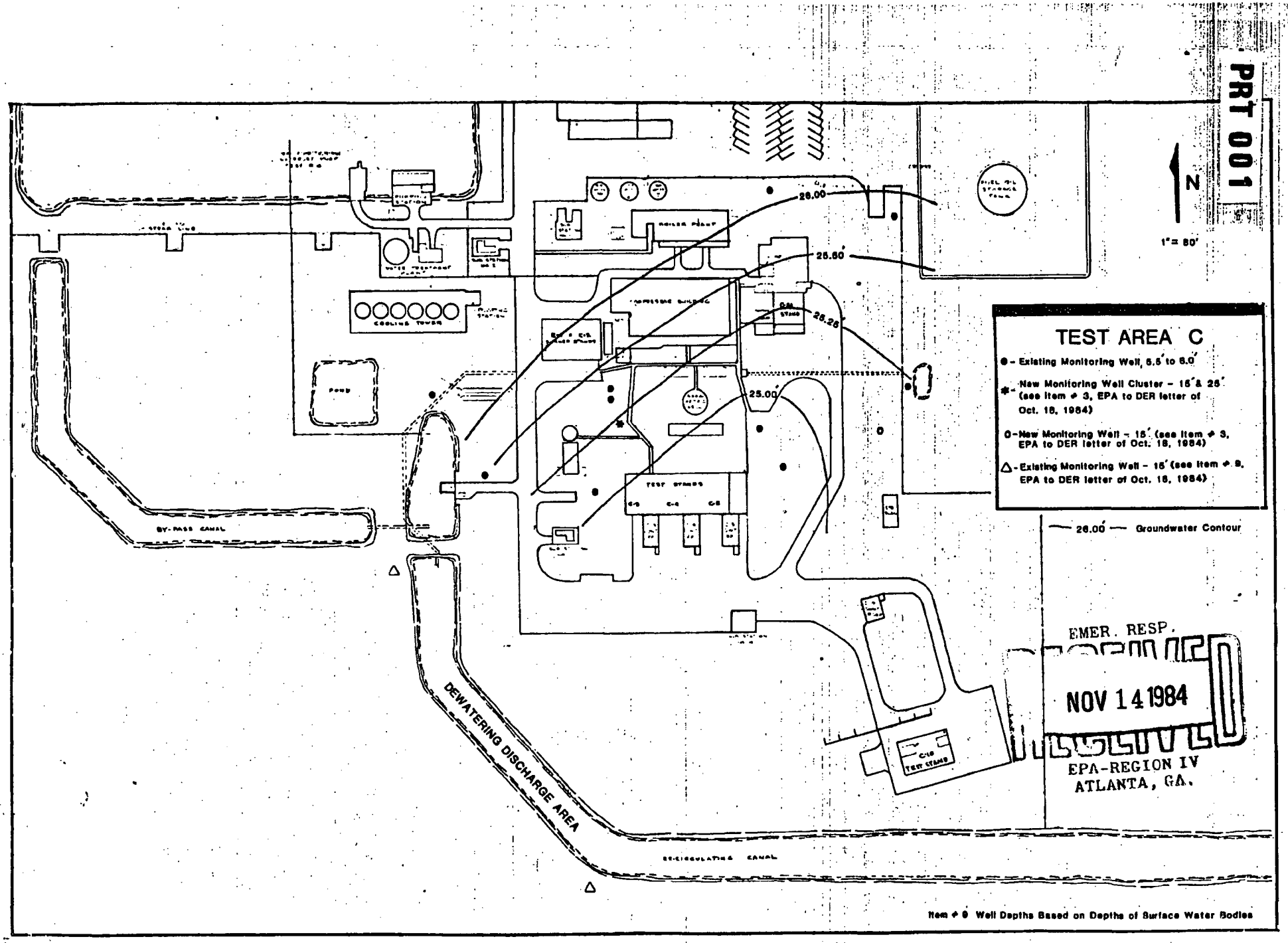
4. The DER sampling and analysis QA/QC program will be incorporated into the sampling and analysis activities of the remediation contractor for execution of the landfill ground water remedial action plan.

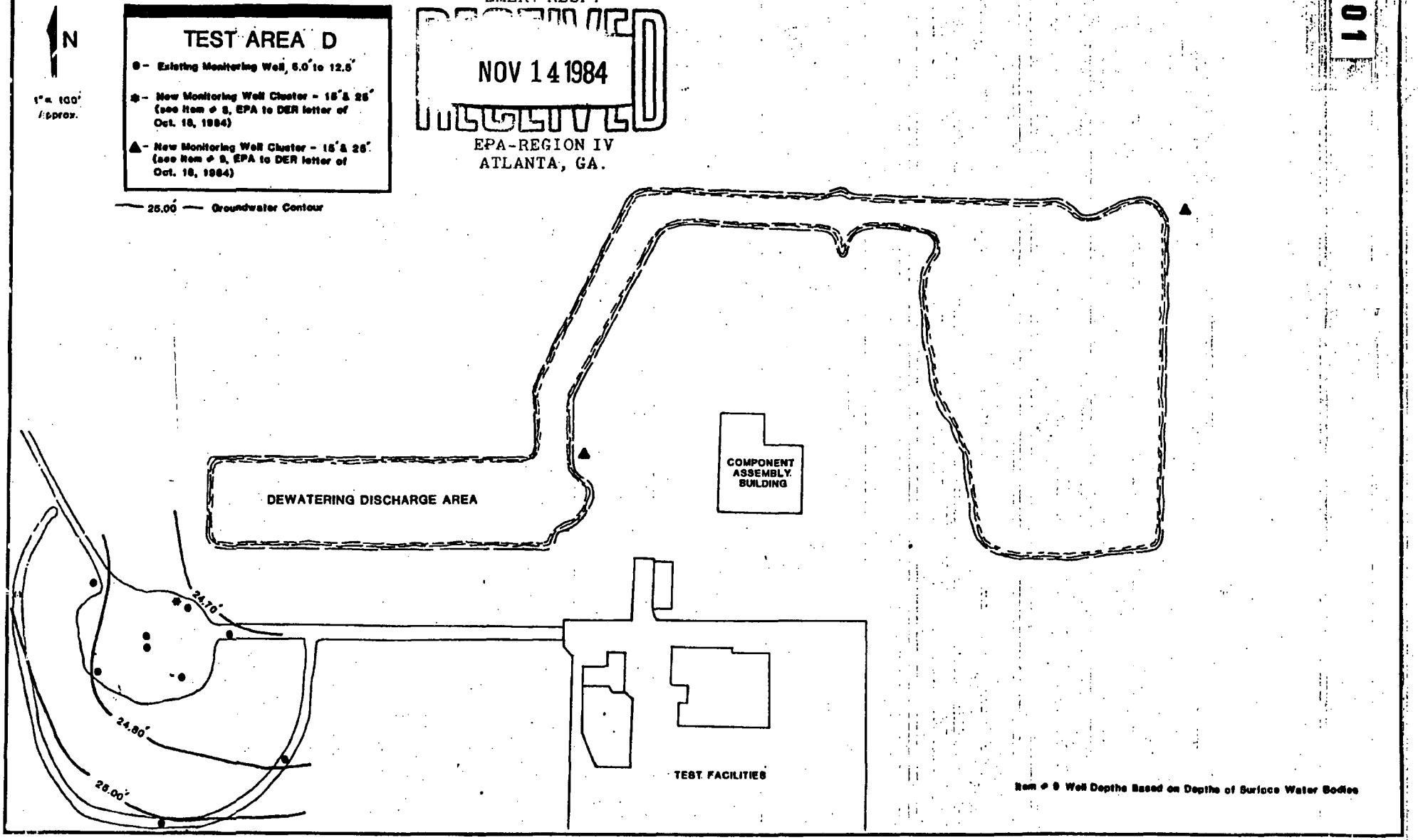
PRT 001



PRT 001


N
1" = 60'
TEST AREA A
● - Existing Monitoring Well, 5.5' to 12.5'
✱ - New Monitoring Well Cluster - 15' & 25' (see Item # 3, EPA to DER letter of Oct. 18, 1984)
▲ - New Monitoring Well Cluster - 15' & 25' (see Item # 9, EPA to DER letter of Oct. 18, 1984)
25.00 — Groundwater Contour
RECEIVED
NOV 14 1984
EPA-REGION IV
ATLANTA, GA.
Item # 9 Well Depths Based on Depths of Surface Water Bodies
DEWATERING DISCHARGE AREA
24.25'
24.50'
SOUND REDUCTION WALL
FIRE PROTECTION PUMP
25.00'
WASTE TREATMENT PLANT
A-AREA NAT. GAS SHUT OFF
C-AREA NAT. GAS SHUT OFF
OFFICE
PARKING


PRT 001
N
1"= 80'
26.00
25.50
25.25
25.00
TEST AREA C
● - Existing Monitoring Well, 5.5' to 6.0'
✱ - New Monitoring Well Cluster - 15' & 25' (see item # 3, EPA to DER letter of Oct. 18, 1984)
O - New Monitoring Well - 15' (see item # 3, EPA to DER letter of Oct. 18, 1984)
△ - Existing Monitoring Well - 15' (see item # 9, EPA to DER letter of Oct. 18, 1984)
26.00 Groundwater Contour
EMER. RESP.
RECEIVED
NOV 14 1984
EPA-REGION IV
ATLANTA, GA.
BY-PASS CANAL
DEWATERING DISCHARGE AREA
COOLING TOWER
POND
TEST STANDS
Item # 9 Well Depths Based on Depths of Surface Water Bodies



PRT 001

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

November 30, 1984

Mr. Charles Jeter
Regional Administrator
U.S. Environmental Protection
Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Charles:

As you know, United Technologies/Pratt and Whitney Aircraft is proposed to be added to the National Priority List during the next update. The department has been working with Pratt and Whitney for well over one year in the review and approval of detailed remedial action plans that will address cleanup and long-term monitoring of areas of the site contaminated with PCB's and VOC's. We expect to conclude a Consent Agreement with United Technologies in the near future. This Consent Agreement will adopt the approved remedial action plans by reference and will provide for an expeditious site cleanup. Members of your staff have participated in a recent Regional Response Team (RRT) meeting which provided the forum for a complete technical and administrative review of the remedial action plans. A final RRT meeting to discuss any remaining remedial action plan revisions deemed necessary will be held in early to mid December.

A key factor in the remedial action plan addressing excavation and removal of PCB contaminated soils is that this work be conducted during South Florida's "dry season" which extends only until May. An expedited legal resolution to the contamination problems at the Pratt and Whitney site is essential to the implementation of site remedial actions during this year's dry season.

Due to the time factors involved and the fact that the execution of a Consent Agreement appears imminent, I request that the United Technologies/Pratt and Whitney site be assigned a state enforcement lead status. The department will continue to work with those members of your staff involved with this site to insure that all of EPA's concerns are addressed.

Sincerely,

Victoria J. Tschinkel
Secretary

VJT/mh

cc: Thomas Devine ✓
Al Smith

PRT 001

DEC 13 1984

Ms. Victoria J. Tschinkel
The Secretary
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee
Florida 32301-8241

Dear Ms. Tschinkel:

With regard to your letter of November 30, 1984, requesting that the United Technologies / Pratt and Whitney Aircraft Site be assigned a State Enforcement Lead status; members of our staff are very aware of the Pratt and Whitney situation and have expressed to me the need to move rapidly with classification as you have requested. We accept and affirm your request for classification with the understanding that your Department and EPA will continue to work together closely to oversee remedial activities at the Site and to assure that those activities are patterned by both State and Federal environmental laws, regulations, and policies. In the near future, we hope to address the issue of FDER and EPA cooperation in CERCLA enforcement matters through a mutually agreed upon site enforcement agreement. The adoption of such an enforcement agreement should help both of our CERCLA-oriented programs to work more effectively and efficiently.

We appreciate the need to move quickly and forthrightly with the Pratt and Whitney Site. Thank you for your consideration and your timely attention to this matter.

Sincerely,

Al J. Smith
Superfund Coordinator

PRT 001

DEC 21 1984
DEC 26 1984

4W-ER

Mr. Roy Duke
District Manager
Southeast Florida District
F.D.E.R.
3301 Gun Club Road
P.O. Box 3858
West Palm Beach, Florida 33402

Re: The Pratt & Whitney/United Technologies Site
West Palm Beach, Florida

Dear Mr. Duke:

In the past the USEPA and the FDER have cooperated with regard to enforcement activities at many of Florida's CERCLA-involved hazardous waste sites. As you know, once a site becomes listed on the National Priorities List, the provisions of the NCP and CERCLA must be stringently adhered to. The ultimate goal is complete cleanup and the production of a sufficient data base to support the deletion of the site from the List. Therefore, as a State Lead site on the Proposed Update to the NPL, the Pratt & Whitney site must undergo even closer EPA scrutiny with regard to the extent of cleanup to ensure that the requirements for deletion can be met. Since EPA and FDER will remain cooperatively involved in the remedial activities at the Site throughout the upcoming private party cleanup, the determinations necessary to support this deletion will be made much easier.

Our Superfund Program's Remedial Action Section has recently completed an intensive review of Pratt & Whitney's proposed Remedial Action Plan. The Plan was reviewed for technical acceptability according to four criteria as outlined in Lee Thomas' memo of November 2, 1984, "Issuance of Guidance for Feasibility Studies under CERCLA". The criteria are performance, reliability, implementability, and safety. After several revisions to the Plan were made reflecting EPA comments, we now find the Plan to be in accordance with the above referenced criteria.

We are currently working toward a general EPA/FDER CERCLA Enforcement Agreement which will provide the framework for subsequent site-specific agreements. However, this process will not be final until appropriate negotiations with the State are completed. In the interim, we would like your consideration in ensuring that the upcoming FDER Consent Order with Pratt & Whitney is reflective of both State and Federal requirements. Accordingly, we would like to request that a suitably worded paragraph be considered for inclusion in the Order indicating that Pratt & Whitney must conform to all Federal laws administered by EPA as well as all State laws enforced by FDER.

My staff will be contacting you to discuss this matter further. Thank you for your consideration.

Sincerely,

/s/ George L. Harlow

Acting

Thomas W. Devine
Director
Waste Management Division

file 1.11

MEMORANDUM

SUBJECT: Pratt and Whitney Aircraft/United Technologies Corp.
FLD001447952
West Palm Beach, Florida

FROM: Steve Heare, Chief
Compliance and Implementation Branch
Office of Waste Programs Enforcement

TO: The Record

The purpose of this memorandum is to discuss the basis for EPA's determination that the Pratt and Whitney/United Technologies Corp. site in West Palm Beach, Florida is subject to RCRA corrective action authorities and does not meet any of the established criteria (see attached cover letter) for listing on the NPL. The site was originally proposed for the NPL on September 18, 1985. EPA proposes to drop this site from the proposed NPL at this time.

A. RCRA Interim Status

The facility submitted a Notification of Hazardous Waste Activity, pursuant to RCRA Section 3010(a), on August 18, 1980 (acknowledged November 4, 1980). The facility was granted interim status on November 19, 1980, when it submitted a Part A permit application for container storage, tank treatment, and other treatment units.

B. Current Permit Status

Pratt and Whitney filed a Part B permit application on May 11, 1983 (updated September 27, 1983), for container storage, tank storage, tank treatment, and other treatment units.

The State approved a partial closure plan for the incinerator units on September 9, 1984. The facility filed an application for a five year permit with the State on August 19, 1986. On June 2, 1987, the State issued the facility the first part of a five-year treatment and storage permit. EPA Region IV will issue the corrective action portion of the permit.

C. Recommended Action on NPL Listing

The Pratt and Whitney/United Technologies Corp. site does not meet any of the current NPL/RCRA listing criteria. Given the current status of the facility, RCRA 3008(h) corrective action authorities are available to address problems at the site. In addition, RCRA 3004(u) and 3004(v) authorities will be available if a RCRA permit is issued. EPA concludes that the Pratt and Whitney site should not be proposed for listing on the NPL at this time. If EPA later determines that the owner or operator is bankrupt or unwilling, as defined under this policy, to clean up the site adequately, it can repropose the site for the NPL.

National Priorities L Site

Hazardous waste site listed under the
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)("Superfund")

PRATT & WHITNEY AIRCRAFT/UNITED TECHNOLOGIES CORP.
West Palm Beach, Florida

Conditions at listing (October 1984): The Pratt & Whitney Aircraft/ United Technologies Corp. Site comprises about 7,000 acres in West Palm Beach in north central Palm Beach County, Florida. Jet engines have been manufactured and tested on the site since 1957. Pratt & Whitney is a privately-owned Canadian-based operation and a division of United Technologies Corp.

On the site are a sanitary landfill where solvents were disposed of, a solvent storage tank that leaked approximately 2,000 gallons of trichloroethane through an underground valve, a solvent distillation area, and jet fuel heaters which contained PCBs until the mid-1970s.

Ground water and surface water are contaminated with PCBs and organic solvents, according to tests conducted by Pratt & Whitney. The company also found that the well serving its 7,200 employees is contaminated with solvents.

Pratt & Whitney has installed a forced aeration system to remove volatile organic chemicals (VOCs) from its well fields and is involved in discussions with the State regarding PCBs and landfill remedial actions.

The plant received Interim Status under Subtitle C of the Resource Conservation and Recovery Act (RCRA) when it filed Part A of a permit application. In 1983, it submitted Part B of the application.

Status (January 1986): On April 26, 1985, the company signed a Consent Agreement with the State under which the company is to implement a State-approved remedial action plan to deal with VOCs and PCBs.

Other areas of contamination, including PCB-contaminated soil and a buried leaking waste oil tank containing VOCs, have been discovered on the property.

The Pratt & Whitney facility was first proposed for the NPL as part of Update #2. In response to public comments received, EPA completely reevaluated the site and made a significant change in its score on the Hazard Ranking System, which EPA uses to assess sites for the NPL. Consequently, EPA reproposed the Pratt & Whitney facility on September 18, 1985 (50 FR 37950) as part of NPL Update #4 and solicited comments on the revised score.

Status (November 1987): EPA is proposing to drop Pratt & Whitney Aircraft/ United Technologies Corp. from the proposed NPL. Because it is a treatment, storage, or disposal facility, it is subject to the corrective action authorities of Subtitle C.

Under the State-approved remedial action plan, Pratt & Whitney is pumping and treating contaminated ground water.

In June 1987, the State issued the facility a 5-year RCRA permit for treatment and storage units. EPA will issue the corrective action portion of the permit, which the State is not yet authorized to issue.

in early 1988

EPA intends to pursue cleanup under RCRA authorities and will ensure that the cleanup protects public health and the environment. EPA can later repropose the site for the NPL if it determines that the owner or operator is bankrupt or unwilling to clean up effectively.

Circle appropriate response category: (V) R P (S) D

Circle status code (if any): I (O) C

Does summary reflect categories / codes ? YES

I certify that all information is accurate and up-to-date and has been reviewed by enforcement personnel from the Office of Regional Counsel.

Superfund Branch Chief

(Signature, Date)